



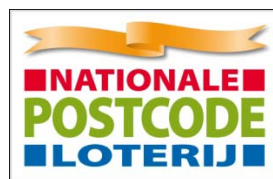
NATURAL AND HISTORIC RESOURCES UNIT

**MONITORING PROGRAM FOR WATER BIRDS INHABITING
THE SALT FLATS LOCATED ON NORTHWESTERN
BONAIRE, DUTCH CARIBBEAN**

YEAR REPORT 2010



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1. Introduction.

This report compares results of three continuous years (2008 to 2010) monitoring water birds in the eight hyper saline lagoons located on the Northwest of Bonaire, Dutch Caribbean: Salina Matijs, Salina Bartol, Salina Funchi, Salina Wayaka, Salina Slagbaai, Salina Goto, Salina Tam and Salina Frans. We present results on diversity (number of species) and abundance (number of individuals) for each lagoon. Combining these two results we create a “habitat importance index” that allows for a comparison among the salt flats of their significance as a habitat for waterbirds. We also present average bird density (number of birds per Ha) per lagoon. Finally, including all the salt flats in one group, we present relative abundance of species (percentage of each species of the total number of individuals). Based on all these results and their analysis we provide recommendations for future monitoring activities and other aspects of the management of these areas and/or species of water birds. All the data obtained during the three years are uploaded to the e- Bird website: www.ebird.com

For more information on the study area, methodology and the background of the project refer to the reports: “Monitoring program for water birds inhabiting the salt flats located in Northwest Bonaire, Netherlands Antilles. Year Report 2008”, available from STINAPA Bonaire in our website: www.stinapa.org

2. Objectives

2.1 Main Objectives

- Determine the number of species present in each one of the eight salt flats located on the Northwest of Bonaire;
- Determine the number of individuals present in each one of the salt flats located on the Northwest of Bonaire;
- Based on diversity and abundance, compare the importance as a habitat for water birds amongst the eight salt flats located in the Northwest of Bonaire;
- Determine average water bird density in the eight salt flats located in the Northwest of Bonaire;
- Determine the combined relative abundance of water birds in the eight salt flats located in the Northwest of Bonaire;
- Provide management recommendations based on the results of the surveys.

2.2 Secondary objectives.

- Learn about bird behaviour and ecology during the surveys.
- Train and educate staff and volunteers in bird monitoring techniques.
- Find unusual birds or species never recorded in the island of Bonaire.
- Find, identify and report ringed migratory waterbirds.
- Create awareness for the public about the bird life on Bonaire.
- Share the obtained data on the e-Bird website

3. Results and Discussion

3.1 Species diversity

We can observe in figure 1 that all the surveyed salt flats show different degrees of variability in the number of species present per year, however precisely the same lagoons score high, medium or low during the three years. Salina Slagbaai, Salina Goto, Salina Matijs and Salina Frans are at the top half in diversity of species and the same four (Salina Tam, Salina Wayaka, Salina Bartol and Salina Funchi) are on the bottom. This is good evidence that some of the physical, chemical or biological characteristics of the top 4 must be more appealing for a larger number of water bird species. On a first glance, the sheer size of the area could be the simple explanation, however Salina Frans being the smallest of them all and always being in the top 4, tells us that some other ecological features must account for these disparities in the diversity results. These numbers show that these lagoons are not entirely alike and when it comes to study their ecology each one has to be looked at individually and, most important, results and conclusions on one of them cannot be easily extrapolated to others. The next step is to look for similarities among these two groups in the results of the base line study of the physical, chemical and biological characteristics of salt flat done by STINAPA Bonaire and FLASA (Fundacion La Salle de Ciencias Naturales, Venezuela)*. The difference in number of species present in every individual salt flat each year is in all likelihood the result of natural variability.

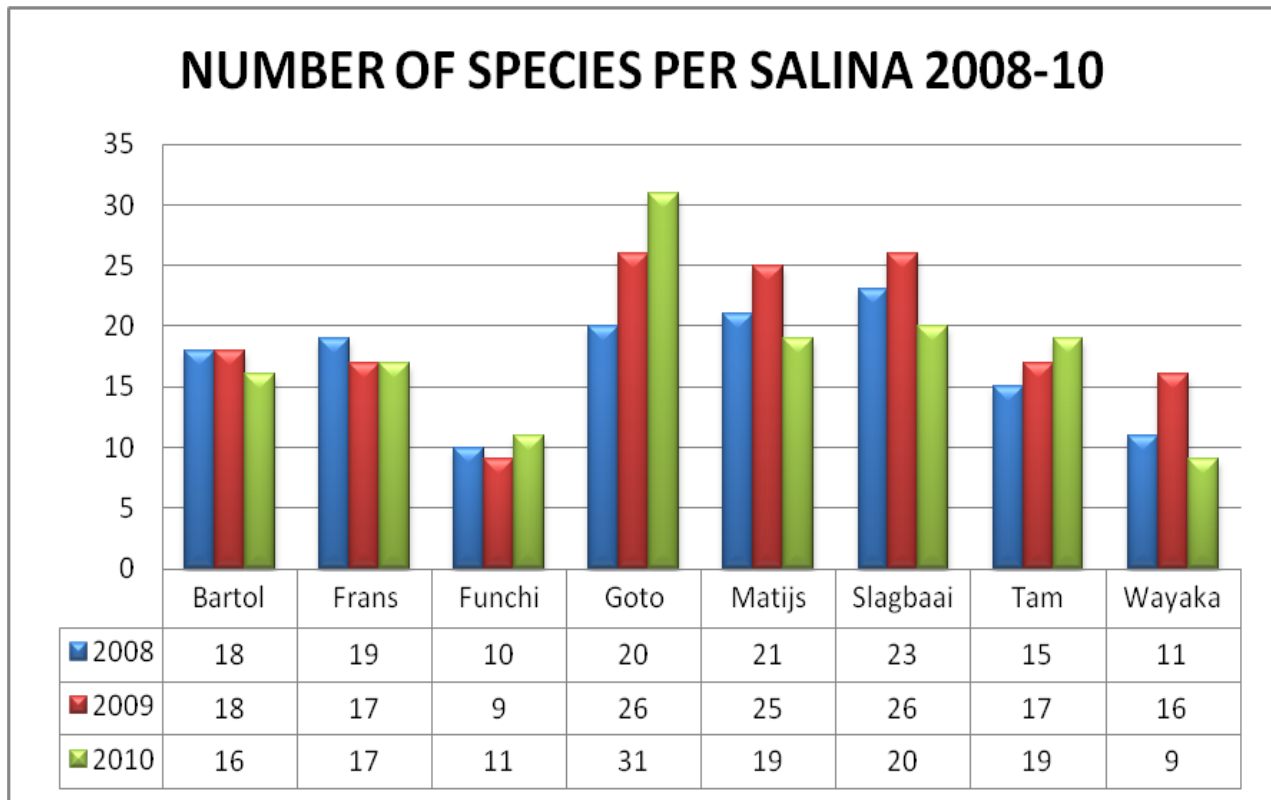


Figure 1. Species diversity per Salina from 2008 to 2010.

*Report available at www.stinapa.org.

3.2 Number of individuals

Parallel to the results on species diversity, there is also variability among the salt flats in the amount of individuals present in them for all the three years. As expected, this variability is even larger than the one found in the number of species. We can observe in figure 2 that once again Salina Goto, Salina Slagbaai and Salina Matijis are the top 3, most likely for the same reasons discussed in the previous section “Species diversity”.

Looking at both figures (1 and 2) we cannot find any significant trends in the number of individuals and species present, neither we can find an important disparity with the numbers of our baseline year, 2008. This is a strong indication that the ecological function of the salt flat as a habitat for water birds is in a stable condition within the expected natural variability. Therefore, we consider them to be “in good health” and STINAPA Bonaire will use in the future these numbers a point of reference for evaluating the conditions of these lagoons and the potential need for management actions.

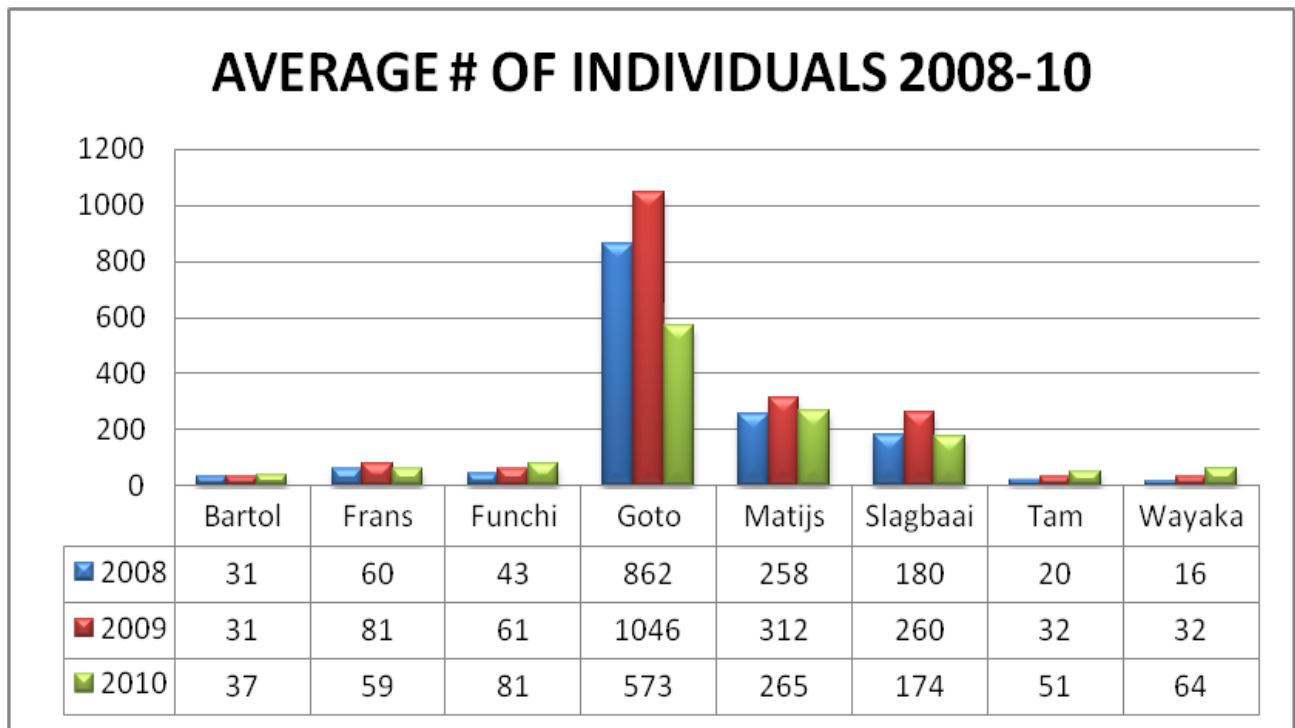


Figure 2. Number of individuals (year average) per lagoon from 2008 to 2010.

In 2008, our baseline year, we created an importance index for the salt flat by simply multiplying the number of individuals by the number of species present on each one. The objective was to help envision the individual significance of each lagoon and the differences among them as a habitat for waterbirds. Before going into discussion about this, it is important to clarify that every Salina included in this study have a high conservation value and that a low number in the importance index does not imply a low value of the Salina as a habitat. Instead, this is just a tool to compare the salt flat among themselves.

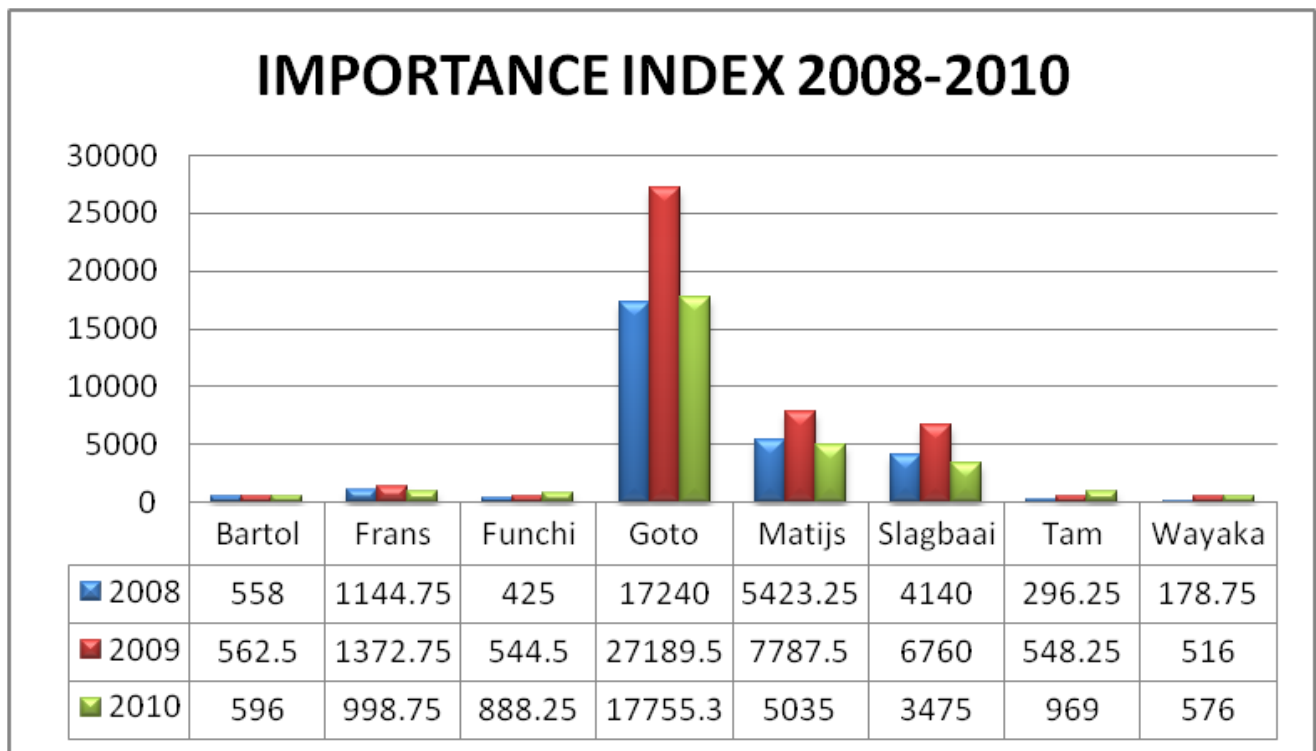


Figure. 3 Habitat importance index from 2008 to 2010

In figure 3 we can clearly observe for all the three years Salina Goto with the highest values and the second and third salt flats scoring only about a third of those values. As previously discussed in the reports of 2008 and 2009, Salina Goto, which is already a Ramsar site, clearly stands out as the most valuable of all the salt flats on north-western Bonaire but only a small portion of this lagoon is located inside the boundaries of the Washington Slagbaai National Park. Therefore, these boundaries must be expanded to include the whole lagoon and its basin area in order to provide it with the legal protection it ought to have and simultaneously increase the conservation value of our terrestrial national park. Further, the entire areas of Labra and Brasil, already under the management of STINAPA Bonaire, should be included in this expansion as well so the whole system of hyper saline lagoons and their catchment areas in the north western of the island are provided with adequate protection.

The main motivation to consider all these lagoons as one habitat system instead of individually separated habitats is that most species of water birds move among all of them and virtually no species are found in only one or two of the salt flat. Another occurrence that shows the importance of this “salt flats system” becomes apparent during extreme climatic events. For instance, when precipitation exceeds the habitual amount and the water level of the salt flat exceeds a certain limit, it has been observed that the number of water birds drops dramatically in the 3 salt flats with regularly higher abundance and diversity (Salina Goto, Salina Slagbaai and Salina Matijis) but increases enormously in the others.

In order to give optimal protection and the international recognition that this system of salt flats deserves we strongly recommend that besides expanding the boundaries of the Washington Slagbaai National Park to include the eight lagoons, to also designate the entire park as a Ramsar site. We propose to use the name Washington Slagbaai for the new designation.

3.3 Bird density

Logically, the great differences in area size among the salt flats affect fundamentally the results and, as can be seen in figure 4, the three smallest salt flats show the highest values and the greater variability. It is important to remark that more than 50% of the densities shown in this chart are caused by only one species of bird, Greater Caribbean flamingo (*Phoenicopterus ruber ruber*), and only 3 other species account for more than 5%: Lesser Yellowlegs (*Tringa favipes*), Black-necked stilt (*Himantopus mexicanus*) and Least sandpiper (*Calidris minutilla*).

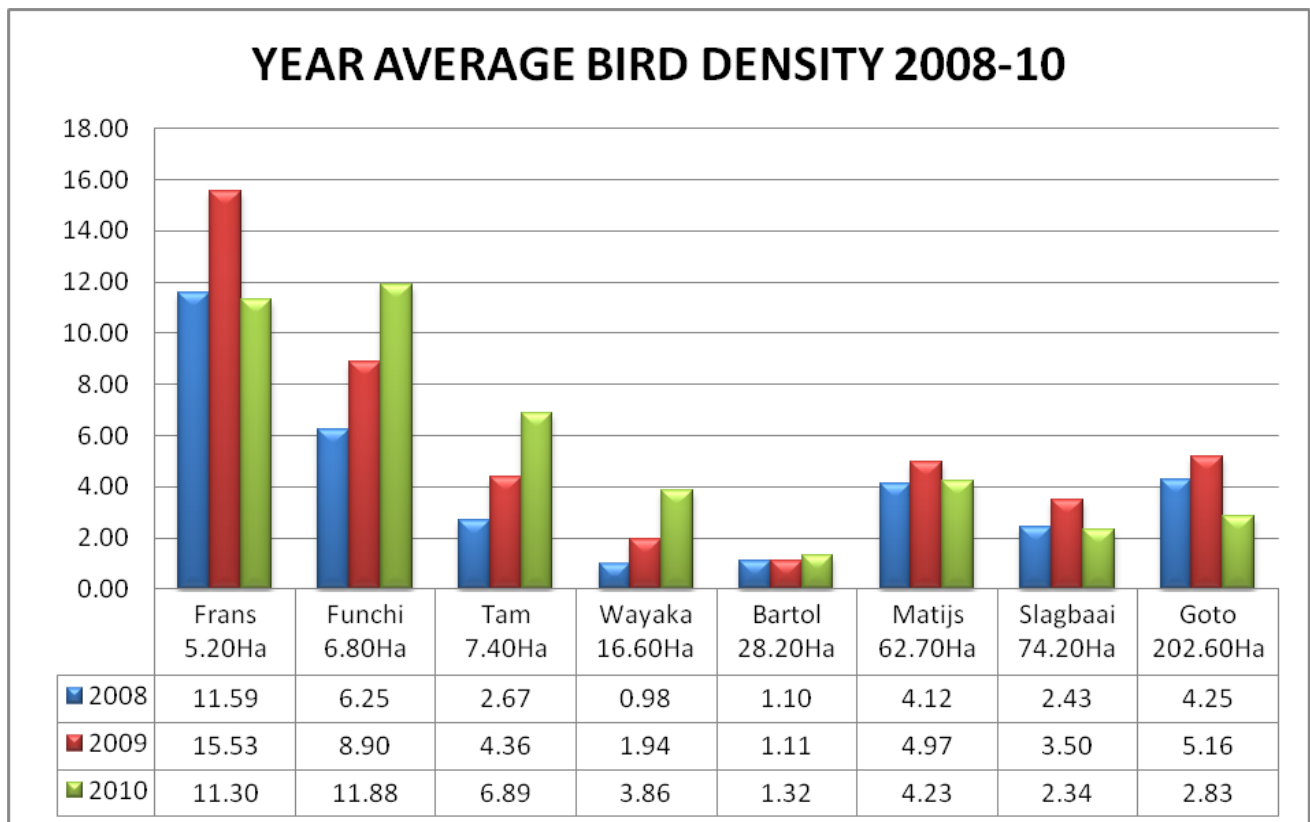


Figure 4. Bird density per Salina from 2008 to 2010. Salt flats are ordered by area size.

3.4 Relative abundance

Looking at table number 1 and its visualization on the pie chart it is obvious that the Greater Caribbean Flamingo is by far the species with the largest presence in the salt flat and accounts for more than half of the total number of individual birds. The relative abundance of this species also shows a decreasing trend, however a closer look at the data reveals that this is not caused by a lower amount of flamingos recorded each year but instead by a larger presence of other species, mainly Black-necked stilts, Semi-

palmated sandpipers, and non identified shore birds. In fact, the number of flamingos increased significantly from 2008 to 2009, so there is no cause for concern in this decreasing trend.

SPECIES	2008	2009	2010	AVERAGE	STA. DEV.
Greater Caribbean Flamingo	58.64	54.28	51.82	54.91	3.45
Black-necked stilt	4.35	8.18	5.01	5.85	2.05
Lesser yellowlegs	5.39	6.93	6.57	6.30	0.81
Least sandpiper	8.15	4.79	3.97	5.64	2.21
Barn swallow	3.25	3.18	0.10	2.18	1.80
Laughing gull	1.67	2.93	1.44	2.01	0.80
Semipalmated sandpiper	3.11	2.32	8.45	4.63	3.33
White-cheeked pintail	1.73	2.21	1.90	1.95	0.24
Greater yellowlegs	0.56	2.07	1.80	1.48	0.81
Least tern	1.97	2.00	2.36	2.11	0.22
NOID peeps	0.75	1.96	7.70	3.47	3.71
Snowy egret	1.31	0.54	1.02	0.96	0.39
Thick-billed plover	1.09	0.14	1.04	0.76	0.53
Other	8.03	8.47	6.82	7.77	0.85
Total	100.00	100.00	100.00	100.00	

Table 1. Species percentage for each year. Species names presented only for those with a presence of at least 1% of the total number of individuals in at least 1 of the 3 monitoring years. The rest of the species (30) are included in the last row “Other”. The average percentage of the 3 years is presented in the pie chart below.

Species included in row “Other”:

- Magnificent frigate bird
- Yellow-crowned night heron
- Willet
- Semi-palmated plover
- Piping plover
- Mallard
- Tricolored heron
- Great egret
- Ruddy turnstone
- Common tern
- Cattle egret
- Pied-billed grebe
- Belted kingfisher
- Black-bellied plover
- Green-winged teal
- Osprey
- Black-crowned night heron
- Short billed dowitcher
- Snowy plover
- Spotted sandpiper
- Blue-winged teal
- Reddish egret
- Great blue heron
- Brown pelican
- Royal tern
- Green heron
- Least grebe
- Neotropic cormorant
- Sanderling
- Whimbrel

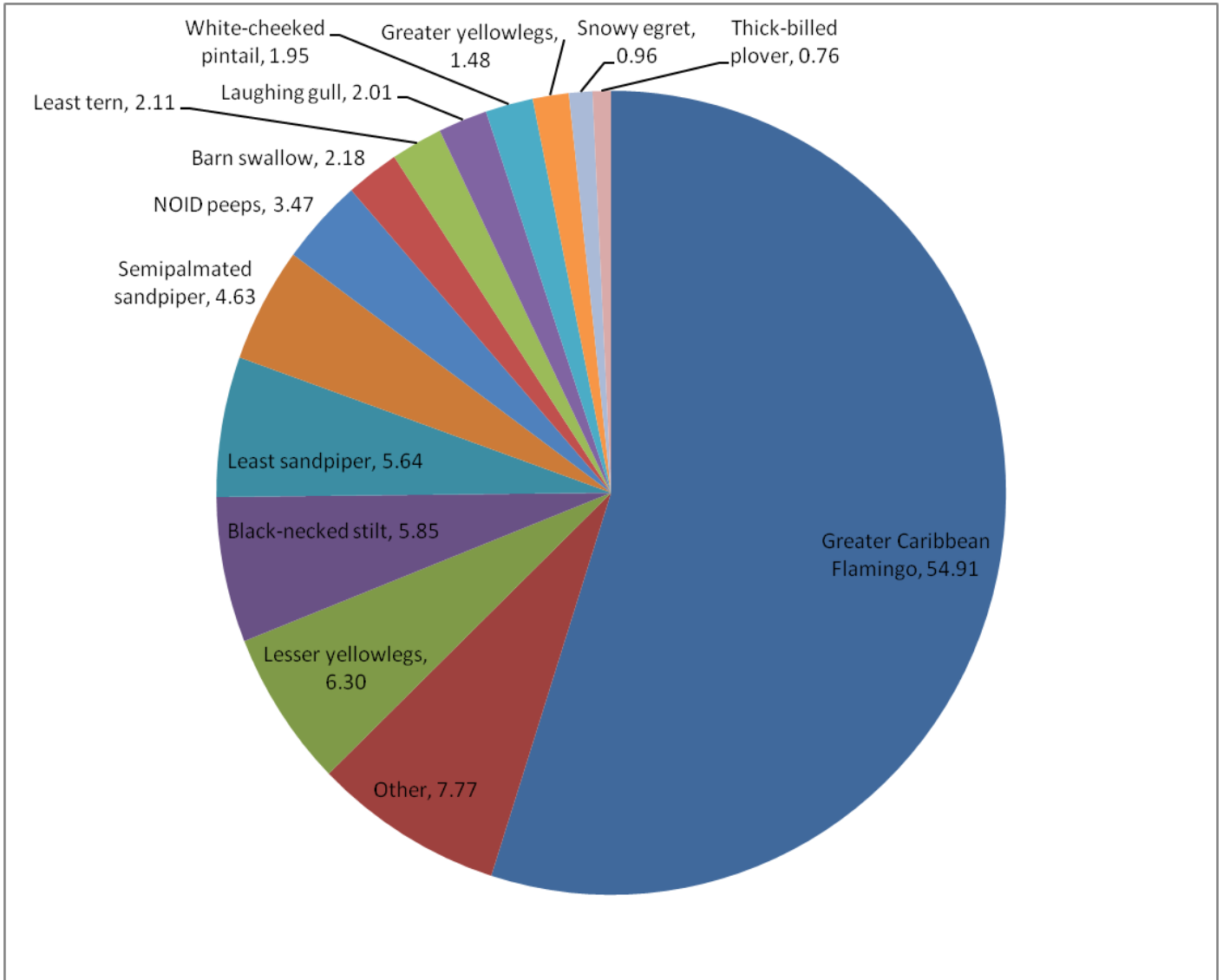


Figure 5. Average relative abundance of water birds in the salt flat for 2008, 2009 and 2010

Regarding the secondary objectives of this monitoring program:

- a) We did not observed ringed birds during any of the surveys done in the three monitoring years;
- b) We did not found any species that was not previously recorded for the island;
- c) The 3 volunteers participating in this monitoring program received training in bird identification and monitoring techniques and have accumulated an adequate amount of experience to operate independently, which they did in 2010, carrying out surveys on their own and co-authoring this report. Their commitment and degree of involvement in the monitoring program is remarkable;
- d) Three reports (including this one) were produced, distributed and made available for the general public on our website www.stinapa.org

- e) All data from the three monitoring years are uploaded in the e-Bird website:
www.ebird.com

4. Recommendations

- Expand the boundaries of the Washington Slagbaai National Park to include all the salts flats included in this monitoring program as well as their catchment areas in order to give adequate protection to the whole system of lagoons located in northwestern Bonaire.
- Approach the Ramsar convention with the proposal to change the Ramsar designations of Salina Slagbaai and Salina Goto for one denomination that will include all the Salt flat in the system using the name of our Washington Slagbaai National Park.
- Keep collecting data for the long term monitoring programs. It is fundamental for the proper management of our natural resources.
- Hire more staff for the Natural and Historic Resources Unit of STINAPA Bonaire.
- As resources and/or time become available, conduct scientific research for a better understanding of the ecological functions of the salt flat as a habitat for water birds.
- As resources and/or time become available, start baseline research for a monitoring program for the nesting season of our resident waterbirds.
- As resources and/or time become available, expand the monitoring program in order to include the salt flats in Central and South of Bonaire.
- Improve this monitoring program by moving up to the next level through participation in the CWC (Caribbean Waterbird Census). This is an initiative taken by the SCSCB (Society of Conservation and Study of Caribbean Birds).