Color codes

Fields back-shaded in light blue relate to data and information required only for RIS updates.

Note that some fields concerning aspects of Part 3, the Ecological Character Description of the RIS (tinted in purple), are not expected to be completed as part of a standard RIS, but are included for completeness so as to provide the requested consistency between the RIS and the format of a 'full' Ecological Character Description, as adopted in Resolution X.15 (2008). If a Contracting Party does have information available that is relevant to these fields (for example from a national format Ecological Character Description) it may, if it wishes to, include information in these additional fields.

1 - Summary

Summary

The 1295 ha Ramsar Site Klein Bonaire (687 ha island, including a 500 m bufferzone of 608 ha) is part of the Bonaire Marine Park, managed by conservation organisation STINAPA. The bufferzone slopes down to more than 200 m deep, with only some 56 ha between 0-6 m deep. The fringing coral reefs are home to virtually every species of hard and soft coral found in the Caribbean. More than 340 fish species live here, making it one of the healthiest, most resilient and most bio-diverse reefs in the region. Conservation International considers the waters around Bonaire (including Klein Bonaire) to be a hotspot of Caribbean biodiversity.
Klein Bonaire island is located about 800 metres off the central west coast of Bonaire. The low coral-limestone island is one of the last remaining undeveloped islands of its size in the Caribbean. While sparse shrubland and cacti dominate the island, the eradication of goats since the 1980s and a reforestation project in 2006-2009, allows for the recovery of the island's natural vegetation and return of native wildlife. Birdlife International has designated Klein Bonaire as an Important Bird Area. The 32 hectares of saliñas and the largely non-touristic sandy beaches (4 ha), make the island a stop-over point for countless species of migratory wetland birds, an important breeding site for terns, notably regionally important Least Terns (Sterna antillarum). The beaches are home to an annual average of approximately 60 sea turtle nests of threatened Hawksbill (Eretmochelys imbricate) and Loggerhead (Caretta caretta) turtles. The site also has a substantial system of subterranean karst caves that provide access to fresh groundwater. This is the habitat of fresh water shrimps. The exact area (ha) of the cave system is still unknown.
The spatial plan prohibits infrastructural developments. The site is nevertheless an important ecotourism destination, especially for divers and snorkelers. Their numbers impose a potential threat for the fragile reefs, along with major threats from climate change, invasive alien and non-alien species (e.g. Lionfish, brown algae). It will be a challenge to keep the reef healthy and resilient, among others through active restoration of damaged sites with native coral species by the Coral Restoration Foundation.

2 - Data & location

2.1 - Formal data

2.1.1 - Name and address of the compiler of this RIS

Responsible compiler

Institution/agency	Wageningen Environmental Research
Postal address	PO Box 47 6700 AA Wageningen The Netherlands

National Ramsar Administrative Authority

Institution/agency	Ministry of Agriculture Nature and Food Quality
Postal address	Bezuidenhoutseweg 73 P.O. Box 20401 2500 EK The Hague The Netherlands

2.1.2 - Period of collection of data and information used to compile the RIS

From year	1993
To year	2018

2.1.3 - Name of the Ramsar Site

Official name (in English, French or Spanish)	Klein Bonaire
Unofficial name (optional)	originally designated as: Klein Bonaire Island & adjacent sea

2.1.4 - Changes to the boundaries and area of the Site since its designation or earlier update

(Update) A. Changes to Site boundary	Yes ◉ No ○
(Update) The boundary has been delineated more accurately	☐
(Update) The boundary has been extended	☑
(Update) The boundary has been restricted	☐
(Update) B. Changes to Site area	the area has increased
(Update) The Site area has been calculated more accurately	☐
(Update) The Site has been delineated more accurately	☐
(Update) The Site area has increased because of a boundary extension	☑
(Update) The Site area has decreased because of a boundary restriction	☐
(Update) For secretariat only: This update is an extension	☐

2.1.5 - Changes to the ecological character of the Site

(Update) 6b i. Has the ecological character of the Ramsar Site (including applicable Criteria) changed since the previous RIS?	Not evaluated

2.2 - Site location

2.2.1 - Defining the Site boundaries

b) Digital map/image
<1 file(s) uploaded>

Former maps	0

Boundaries description

The site boundary coincides with the 500 m line outside the high-watermark, which is the bufferzone that surrounds the island. The Ramsar site now also includes the coral reefs, which were not included in the previous RIS.

2.2.2 - General location

a) In which large administrative region does the site lie? Klein Bonaire is an island located offshore from Bonaire island, in the Caribbean Netherlands

b) What is the nearest town or population centre? Klein Bonaire lies approx. 800 m west of the islands capital Kralendijk

2.2.3 - For wetlands on national boundaries only

a) Does the wetland extend onto the territory of one or more other countries? Yes ○ No ◉

b) Is the site adjacent to another designated Ramsar Site on the territory of another Contracting Party? Yes ○ No ◉

2.2.4 - Area of the Site

Official area, in hectares (ha): 1295

Area, in hectares (ha) as calculated from GIS boundaries: 1294.904

2.2.5 - Biogeography

Biogeographic regions

Regionalisation scheme(s)	Biogeographic region
Marine Ecoregions of the World (MEOW)	Southern Caribbean

3 - Why is the Site important?

3.1 - Ramsar Criteria and their justification

☑ Criterion 1: Representative, rare or unique natural or near-natural wetland types

Hydrological services provided	Brauman et al. 2007 recognises five hydrological services, three of which apply to Klein Bonaire and its bufferzone: 1. Water damage mitigation: this hydrological service concerns reduction of flood damage, dryland salinization, saltwater intrusion and sedimentation (Brauman et al. 2007). It does apply to Klein Bonaire. The annual coastal protection values of the coral reefs of Bonaire as a whole for short-term (i.e. within 10 years) and long-term processes (i.e. beyond 10 years) are estimated at $33,000 and $70,000, respectively. The reefs of Klein Bonaire are part of these figures (Min. EZ, 2013). Furthermore, the three salinas at Klein Bonaire are important for the retention of rain water and eroded sediment, making them crucial for the prevention of siltation of the fringing coral reefs.
Other ecosystem services provided	2. Spiritual and aesthetic: this service concerns provision of religious, educational and tourism values (Brauman et al. 2007). It does apply to Klein Bonaire. Bonairean ecosystems support tourist activities that depend on the quality of the natural environment, such as diving, snorkelling, kayaking, boating, enjoying beaches, and participating in land activities. The tourism sector is an industry with substantial size and financial contribution to the economy of Bonaire. The expenditure by tourists on Bonaire is found to be around $125 million annually. An estimated welfare of around $50 million is contributed by Bonaire's nature to tourism. Marine ecosystems are found to be more economically significant than terrestrial ecosystems on the island. Klein Bonaire is part of these figures (Min EZ, 2013) as it is an important ecotourism destination. 3. Supporting: this service concerns water and nutrients to support vital estuaries and other habitats, preservation of options (Brauman et al. 2007). It does also apply to Klein Bonaire. The fresh water springs for instance provide water for wildlife. The salinas provide food for migratory birds that can be enjoyed by bird-watchers, while the retention of rain water and sediments prevents siltation of the reefs, which can be enjoyed by snorkelers and divers. Marine fishing provides an important source of income and livelihood on Bonaire, also many people fish for recreational purposes. A large part of the catch is composed of reef-dependent species. The reef-related total commercial fisheries for Bonaire as a whole are valued at almost $400,000 annually, while the recreational fishery value is estimated at an economic value of almost $700,000 per annum. The reefs in the bufferzone of Klein Bonaire contribute to these figures (Min EZ, 2013).
Other reasons	Klein Bonaire is one of the last remaining, uninhabited and naturally vegetated islands of its size in the Caribbean. It has three saliñas, five freshwater springs and largely non-touristic sandy beaches making it an important stop-over site for migratory water bird species, breeding site for terns and nesting site for sea turtles. Klein Bonaire is part of the famous Bonaire Marine Park. It's fringing coral reefs in the bufferzone are home to virtually every species of hard and soft coral found in the Caribbean (IUCN, 2011; Perry et al., 2013). More than 340 fish species live here, making it one of the healthiest, most resilient and most bio-diverse reefs in the region. Conservation International considers the waters around Bonaire (including Klein Bonaire) to be a hotspot of Caribbean biodiversity.

☑ Criterion 2 : Rare species and threatened ecological communities

☑ Criterion 3 : Biological diversity

Justification

- Bonaire's fringing coral reefs are home to virtually every species of hard and soft coral found in the Caribbean. More than 340 fish species live here, making it one of the healthiest and most bio-diverse reefs in the region.
- The sandy beaches of Klein Bonaire are the main nesting areas for sea turtles at Bonaire. Each year an average of 60 nests of the critically endangered Hawksbill (Eretmochelys imbricate) and the endangered Loggerhead (Caretta caretta) turtles can be found here.
- The site also has a substantial system of subterranean karst caves that provide access to fresh groundwater. This is the habitat of fresh water shrimps (Macrobrachuim lucifugum and Typhlatya monae). The exact area (ha) and biological diversity of the cave system is still unclear.
- Birdlife International has designated Klein Bonaire as an Important Bird Area for Bonaire. The island is a stop-over point for many species of migratory wetland birds, and an important breeding site for terns, notably regionally important Least Terns (Sterna antillarum). Klein Bonaire is also significant for the restricted-range species Caribbean Elaenia (Elaenia martinica). Debrot (1997) provided a preliminary biological inventory for the island.
- Biodiversity values are recovering after removal of goats in the 1980s. The island also harbors a population of the threatened West-indian Satinwood (Zanthoxylum flavum).
- An international group of bat experts from the Latin America and Caribbean Bat Conservation Network (RELCOM) designated Klein Bonaire as an Area of Importance for Bat Conservation (AICOM) in December 2018. This is justified by the fact that the cacti on Klein Bonaire have high production of flowers and fruits, suggesting high foraging activity of the two nectar-feeding bats that live on Bonaire Island (Glossophaga longirostris and Leptonycteris curasoae).

☑ Criterion 4 : Support during critical life cycle stage or in adverse conditions

☑ Criterion 8 : Fish spawning grounds, etc.

Justification

The shallow reefs (0 to 4 m depth) in the bufferzone around Klein Bonaire harbour dense populations of Elkhorn coral (Acropora palmata) and Fire coral (Millepora complanata). These complex structures provide critical nursery habitat for specific reef fish species (Nagelkerken 1974). Especially juveniles of the Smallmouth grunt (Haemulon chrysargyreum), Mahogany snapper (Lutjanus mahogany), Blue tang (Acanthurus coeruleus), Ocean surgeonfish (Acanthurus bahianus) and Sergeant Major (Abudefduf saxatilis) depend on these (hydro)coral habitats (Nagelkerken et al. 2000).

3.2 - Plant species whose presence relates to the international importance of the site

Phylum	Scientific name	Criterion 2	Criterion 3	Criterion 4	IUCN Red List	CITES Appendix I	Other status	Justification
Plantae								
TRACHEOPHYTA / MAGNOLIOPSIDA	*Bourreria succulenta*	☐	☑	☐	LC	☐		See Textbox
TRACHEOPHYTA / MAGNOLIOPSIDA	*Erithalis fruticosa*	☐	☑	☐	LC	☐		See Textbox
TRACHEOPHYTA / MAGNOLIOPSIDA	*Jacquinia arborea*	☐	☑	☐		☐		See Textbox
TRACHEOPHYTA / MAGNOLIOPSIDA	*Metopium brownei*	☐	☑	☐	LC	☐		See Textbox
TRACHEOPHYTA / MAGNOLIOPSIDA	*Pithecellobium unguis-cati*	☐	☑	☐	LC	☐		See Textbox
TRACHEOPHYTA / MAGNOLIOPSIDA	*Sideroxylon obovatum*	☐	☑	☐		☐		See Textbox
TRACHEOPHYTA / MAGNOLIOPSIDA	*Zanthoxylum flavum*	☑	☑	☐	VU	☐		DCNA

For hundreds of years the vegetation on Klein Bonaire was heavily degraded due to grazing by feral goats as well as wood-cutting for charcoal. Goats were removed in the 1980's. A reforestation project was started in 2006, which firstly focussed on plants that are low in number and under threat of becoming locally extinct (such as the native and on plants that play a significant ecological role as a fruit or flower source for birds or other fauna, such as 'Watakeli' (Bourreria succulenta), 'Mansaliña Bobo' (Metopium brownei), 'Palu di Huku' (Jacquinia arborea) and 'Palu di Rhambèshi' (Sideroxylon obovatum).
Visits in June and July 2013 proved that the ecosystem showed a remarkable recovery. Species like 'Palu di Huku' (Jacquinia arborea), 'Watakeli' (Bourreria succulenta), 'Mansaliña Bobo' (Metopium brownei), 'Lumbra Blanku' (Erithalis fruticosa) and 'Uña di Gatu' (Pithecellobium unguis-cati) trees were found blossoming and already carrying fruits. These trees enrich the vegetation and produce food for endangered bird species during the dry season. In the past, the Scaly-naped Pigeon (Patagioenas squamosa) and the Yellow-shouldered Amazon Parrot (Amazona barbadensis) occurred on the island, but they disappeared over the decades. Since the reforestation efforts ended in 2009, some Scaly-naped Pigeons already returned again to the island (Debrot 2013).
On Klein Bonaire 76 different species of flora were recorded: 21 trees, 12 shrubs, 20 herbs, 17 species of grasses, 5 succulents and 1 water plant (source: website Stinapa).

3.3 - Animal species whose presence relates to the international importance of the site

Phylum	Scientific name	Species qualifies under criterion				Species contributes under criterion				Pop. Size	Period of pop. Est.	% occurrence 1)	IUCN Red List	CITES Appendix I	CMS Appendix I	Other Status	Justification
		2	4	6	9	3	5	7	8								
Others																	
CNIDARIA / ANTHOZOA	*Acropora cervicornis*	☑	☐	☐	☐	☑	☐	☐	☐				CR	☐	☐	SPAW Annex 3	Steneck et al. 2011
CNIDARIA / ANTHOZOA	*Acropora palmata*	☑	☐	☐	☐	☑	☐	☐	☐				CR	☐	☐	SPAW Annex 3	De Boer, 2010
CNIDARIA / ANTHOZOA	*Agaricia lamarcki*	☑	☐	☐	☐	☑	☐	☐	☐				VU	☐	☐	SPAW Annex 3	De Boer, 2010
CHORDATA / REPTILIA	*Caretta caretta*	☑	☑	☐	☐	☑	☐	☐	☐	19	2003-2014		VU	☑	☑		Stapleton et al. 2014
CNIDARIA / ANTHOZOA	*Dendrogyra cylindrus*	☑	☐	☐	☐	☑	☐	☐	☐				VU	☐	☐	SPAW Annex 3	De Boer, 2010
CNIDARIA / ANTHOZOA	*Dichocoenia stokesii*	☑	☐	☐	☐	☑	☐	☐	☐				VU	☐	☐	SPAW Annex 3	Steneck et al. 2011
CHORDATA / REPTILIA	*Eretmochelys imbricata*	☑	☑	☐	☐	☑	☐	☐	☐	41	2003-2014		CR	☑	☑		Stapleton et al. 2014
CHORDATA / MAMMALIA	*Glossophaga longirostris*	☐	☑	☐	☐	☑	☐	☐	☐				LC	☐	☐		Klein Bonaire is an important foraging area for the species. The site has been designated as an AICOM (Area of Importance for Bat Conservation) 2018.
CHORDATA / MAMMALIA	*Leptonycteris curasoae*	☑	☑	☐	☐	☑	☐	☐	☐				VU	☐	☐		Klein Bonaire is an important foraging area for the species. The site has been designated as an AICOM (Area of Importance for Bat Conservation) 2018.
CNIDARIA / ANTHOZOA	*Orbicella annularis*	☑	☐	☐	☐	☑	☐	☐	☐				EN	☐	☐	SPAW Annex 3	Steneck et al. 2011
CNIDARIA / ANTHOZOA	*Orbicella faveolata*	☑	☐	☐	☐	☑	☐	☐	☐				EN	☐	☐	SPAW Annex 3	Steneck et al. 2011
CNIDARIA / ANTHOZOA	*Orbicella franksi*	☑	☐	☐	☐	☑	☐	☐	☐				VU	☐	☐	SPAW Annex 3	Steneck et al. 2011
Fish, Mollusc and Crustacea																	
CHORDATA / ACTINOPTERYGII	*Abudefduf saxatilis*	☐	☐	☐	☐	☐	☐	☐	☑				LC	☐	☐		Nagelkerken et al. 2000
CHORDATA / ACTINOPTERYGII	*Acanthurus bahianus*	☐	☐	☐	☐	☐	☐	☐	☑				LC	☐	☐		Nagelkerken et al. 2000

Phylum	Scientific name	Species qualifies under criterion				Species contributes under criterion				Pop. Size	Period of pop. Est.	% occurrence 1)	IUCN Red List	CITES Appendix I	CMS Appendix I	Other Status	Justification
		2	4	6	9	3	5	7	8								
CHORDATA / ACTINOPTERYGII	*Acanthurus coeruleus*	☐	☐	☐	☐	☐	☐	☐	☑				LC	☐	☐		Nagelkerken et al. 2000
CHORDATA / ACTINOPTERYGII	*Balistes vetula*	☐	☐	☐	☐	☑	☐	☐	☐				NT	☐	☐		De Boer, 2010
CHORDATA / ACTINOPTERYGII	*Epinephelus itajara*	☑	☐	☐	☐	☑	☐	☐	☐				VU	☐	☐		De Boer, 2010
CHORDATA / ACTINOPTERYGII	*Epinephelus striatus*	☑	☐	☐	☐	☑	☐	☐	☐				CR	☐	☐		De Boer, 2010
CHORDATA / ACTINOPTERYGII	*Haemulon chrysargyreum*	☐	☐	☐	☐	☐	☐	☐	☑				LC	☐	☐		Nagelkerken et al. 2000
CHORDATA / ACTINOPTERYGII	*Hyporthodus niveatus*	☑	☐	☐	☐	☑	☐	☐	☐				VU	☐	☐		De Boer, 2010
CHORDATA / ACTINOPTERYGII	*Lachnolaimus maximus*	☑	☐	☐	☐	☑	☐	☐	☐				VU	☐	☐		De Boer, 2010
CHORDATA / ACTINOPTERYGII	*Lutjanus analis*	☐	☐	☐	☐	☑	☐	☐	☐				NT	☐	☐		De Boer, 2010
CHORDATA / ACTINOPTERYGII	*Lutjanus cyanopterus*	☑	☐	☐	☐	☑	☐	☐	☐				VU	☐	☐		De Boer, 2010
CHORDATA / ACTINOPTERYGII	*Lutjanus mahogoni*	☐	☐	☐	☐	☐	☐	☐	☑				LC	☐	☐		Nagelkerken et al. 2000
CHORDATA / ACTINOPTERYGII	*Mycteroperca interstitialis*	☑	☐	☐	☐	☑	☐	☐	☐				VU	☐	☐		De Boer, 2010
MOLLUSCA / GASTROPODA	*Trapania bonellenae*	☐	☐	☐	☐	☑	☐	☐	☐					☐	☐	New species from Bonaire. Maybe endemic.	Valdes, 2009
Birds																	
CHORDATA / AVES	*Elaenia martinica*	☐	☐	☐	☐	☑	☐	☐	☐	6	2012		LC	☐	☐	IBA-criteria : A2	Birdlife International, 2012
CHORDATA / AVES	*Sternula antillarum*	☐	☑	☐	☐	☑	☐	☐	☐	100	2012		LC	☐	☐	IBA-criteria : A4	Birdlife International, 2012

1) Percentage of the total biogeographic population at the site

The marine fish and coral species in the table above apply to the 500 m bufferzone around Klein Bonaire.

3.4 - Ecological communities whose presence relates to the international importance of the site

Name of ecological community	Community qualifies under Criterion 2?	Description	Justification
Coral reef	☑	Fringing coral reefs around Klein Bonaire	The reefs of Bonaire form an outstanding example of healthy and diverse oceanic island reef nearshore systems. The global rarity and significance lies in the relatively high coral cover and high fish biomass which is in close proximity to the in

Optional text box to provide further information

The reefs of Bonaire form an outstanding example of healthy and diverse oceanic island reef nearshore systems. The global rarity and significance lies in the relatively high coral cover and high fish biomass which is in close proximity to the inhabited islands (Debrot et al., 2017).

4 - What is the Site like? (Ecological character description)

4.1 - Ecological character

Klein Bonaire is a small offshore low coral-limestone island surrounded by a 500 m bufferzone (608 ha) with fringing reefs that support an extremely rich marine fauna. The total land area is approximately almost 7 km² (687 hectares) and includes three saliñas, five freshwater springs or wells and sandy beach areas. The sandy beaches are vital nesting areas for sea turtles, notably the Hawksbill (Eretmochelys imbricate) and Loggerhead (Caretta caretta) turtles.
While sparse shrubland and cacti dominate the island, the eradication of goats since the 1980s is allowing recovery of the island's vegetation and wildlife. The island harbours a population of West-indian Satinwood (Zanthoxylum flavum). A reforestation project between 2006-2017 further supports this recovery process.
The island is a stop-over point for many species of migratory wetland birds, and an important breeding site for terns, notably Least Terns (Sterna antillarum). Klein Bonaire is also significant for Caribbean Elaenia (Elaenia martinica).
The island is uninhabited and undeveloped but people visit the island daily. The island is especially important for ecotourism purposes, mainly diving and snorkeling. The karst waters of the island are home to three freshwater shrimp species: Macrobrachium faunstinum, M. lucifugum and Typhlatya monae (Florijn and Visser 1988; Debrot 2003).

4.2 - What wetland type(s) are in the site?

Marine or coastal wetlands

Wetland types (code and name)	Local name	Ranking of extent (1: greatest - 4: least)	Area (ha) of wetland type	Justification of Criterion 1
A: Permanent shallow marine waters		2	56	Representative
C: Coral reefs		1	60	Representative
E: Sand, shingle or pebble shores		4	4	Representative
G: Intertidal mud, sand or salt flats		0		Representative
J: Coastal brackish / saline lagoons		3	32	Representative
Zk(a): Karst and other subterranean hydrological systems		0		Representative

Other non-wetland habitat

Other non-wetland habitats within the site	Area (ha) if known
Klein Bonaire consists for a very large part of the 'Croton-Lantana-Cordia thicket' (Stoffers in De Freitas et al. 2005)	659

4.3 - Biological components

4.3.1 - Plant species

Invasive alien plant species

Phylum	Scientific name	Impacts	Changes at RIS update
TRACHEOPHYTA/MAGNOLIOPSIDA	*Cordia sebestena*	Actual (minor impacts)	increase
TRACHEOPHYTA/MAGNOLIOPSIDA	*Cryptostegia grandiflora*	Actual (minor impacts)	increase

4.3.2 - Animal species

Other noteworthy animal species

Phylum	Scientific name	Pop. size	Period of pop. est.	%occurrence	Position in range /endemism/other
CHORDATA/AVES	*Charadrius alexandrinus*				
CHORDATA/AVES	*Charadrius wilsonia*				
ARTHROPODA/MALACOSTRACA	*Macrobrachium faustinum*				
ARTHROPODA/MALACOSTRACA	*Macrobrachium lucifugum*				
CHORDATA/AVES	*Phoenicopterus ruber*				
ARTHROPODA/MALACOSTRACA	*Typhlatya monae*				

Invasive alien animal species

Phylum	Scientific name	Impacts	Changes at RIS update
CHORDATA/MAMMALIA	*Felis catus*	Potential	No change
CHORDATA/ACTINOPTERYGII	*Pterois volitans*	Actual (minor impacts)	unknown
CHORDATA/MAMMALIA	*Rattus rattus*	Actual (minor impacts)	unknown

4.4 - Physical components

4.4.1 - Climate

Climatic region	Subregion
B: Dry climate	BWh: Subtropical desert (Low-latitude desert)

Climate change induced sea level rise, higher sea water temperatures and extreme weather events are expected to have a negative impact on Klein Bonaire's fringing coral reefs, sea turtle nesting beaches and Salinas among others. For detailed information see section 5.2.

4.4.2 - Geomorphic setting

a) Minimum elevation above sea level (in metres): 0

a) Maximum elevation above sea level (in metres): 7

- Entire river basin ☐
- Upper part of river basin ☐
- Middle part of river basin ☐
- Lower part of river basin ☐
- More than one river basin ☐
- Not in river basin ☑
- Coastal ☑

Please name the river basin or basins. If the site lies in a sub-basin, please also name the larger river basin. For a coastal/marine site, please name the sea or ocean.

Southern Caribbean Sea

4.4.3 - Soil

- Mineral ☑
- (Update) Changes at RIS update: No change ◉ Increase ○ Decrease ○ Unknown ○
- No available information ☐

Are soil types subject to change as a result of changing hydrological conditions (e.g., increased salinity or acidification)? Yes ○ No ◉

Please provide further information on the soil (optional)

Klein Bonaire consists entirely of limestone sedimentary deposits. The Lower Terrace is partly encircled by recent to sub-recent beach ridges consisting of both sandy and coral shingle areas. The Middle Terrace forms the central part of the island (De Freitas et al., 2005).

4.4.4 - Water regime

Water permanence

Presence?	Changes at RIS update
Usually permanent water present	

Source of water that maintains character of the site

Presence?	Predominant water source	Changes at RIS update
Marine water	☑	No change
Water inputs from groundwater	☑	unknown
Water inputs from precipitation	☑	unknown

Water destination

Presence?	Changes at RIS update
Marine	No change

Stability of water regime

Presence?	Changes at RIS update
Water levels fluctuating (including tidal)	No change

Please add any comments on the water regime and its determinants (if relevant). Use this box to explain sites with complex hydrology:

The karst caves provide access to the groundwater. The groundwater consists of a lens of freshwater that floats on top of saltwater. This causes stratification in salinity. Klein Bonaire has an extensive system of fresh water caves, but the exact area (ha) is not clear.

(ECD) Stratification and mixing regime: The karst caves provide access to the groundwater. The groundwater consists of a lens of freshwater that floats on top of saltwater. This causes stratification in salinity, with a more brackish layer in between.

4.4.5 - Sediment regime

Sediment regime unknown ☑

4.4.6 - Water pH

Alkaline (pH>7.4) ☑

(Update) Changes at RIS update: No change ◉ Increase ○ Decrease ○ Unknown ○

Unknown ☐

Please provide further information on pH (optional):

(Source: De Freitas et al. 2005).

4.4.7 - Water salinity

Fresh (<0.5 g/l) ☑

(Update) Changes at RIS update: No change ○ Increase ○ Decrease ○ Unknown ◉

Mixohaline (brackish)/Mixosaline (0.5-30 g/l) ☐

(Update) Changes at RIS update: No change ○ Increase ○ Decrease ○ Unknown ◉

Euhaline/Eusaline (30-40 g/l) ☑

(Update) Changes at RIS update: No change ◉ Increase ○ Decrease ○ Unknown ○

Hyperhaline/Hypersaline (>40 g/l) ☑

(Update) Changes at RIS update: No change ○ Increase ○ Decrease ○ Unknown ◉

Unknown ☐

Please provide further information on salinity (optional):

The salinity of the springs is fresh. The salinity of the sea water in the bufferzone is eusaline, while the salinity of the salinas may range between eusaline and hypersaline depending the impacts of rainfall and vaporisation.

4.4.8 - Dissolved or suspended nutrients in water

Oligotrophic ☑

(Update) Changes at RIS update: No change ○ Increase ○ Decrease ○ Unknown ◉

Unknown ☐

4.4.9 - Features of the surrounding area which may affect the Site

Please describe whether, and if so how, the landscape and ecological characteristics in the area surrounding the Ramsar Site differ from the site itself: i) broadly similar ○ ii) significantly different ◉

Surrounding area has greater urbanisation or development ☑

Surrounding area has higher human population density ☑

Surrounding area has more intensive agricultural use ☑

Surrounding area has significantly different land cover or habitat types ☑

Please describe other ways in which the surrounding area is different:

The Klein Bonaire island lies some 800 m offshore the main Bonaire island. The sea in between is about 180 m deep. The impact of the surrounding area on Klein Bonaire is therefore rather limited.

4.5 - Ecosystem services

4.5.1 - Ecosystem services/benefits

Provisioning Services

Ecosystem service	Examples	Importance/Extent/Significance
Food for humans	Sustenance for humans (e.g., fish, molluscs, grains)	Medium

Regulating Services

Ecosystem service	Examples	Importance/Extent/Significance
Erosion protection	Soil, sediment and nutrient retention	Medium

Cultural Services

Ecosystem service	Examples	Importance/Extent/Significance
Recreation and tourism	Water sports and activities	High
Recreation and tourism	Nature observation and nature-based tourism	Medium
Scientific and educational	Long-term monitoring site	High

Supporting Services

Ecosystem service	Examples	Importance/Extent/Significance
Biodiversity	Supports a variety of all life forms including plants, animals and microorganizms, the genes they contain, and the ecosystems of which they form a part	High

Within the site: 10000

Outside the site: 10000

Have studies or assessments been made of the economic valuation of ecosystem services provided by this Ramsar Site? Yes ◉ No ○ Unknown ○

Where economic studies or assessments of economic valuation have been undertaken at the site, it would be helpful to provide information on where the results of such studies may be located (e.g. website links, citation of published literature):

The publication "What's Bonaire's nature worth? 2011-2012" draws attention to the economic benefits of biodiversity and highlights the growing costs of biodiversity loss and ecosystem degradation. See: https://www.dcbd.nl/document/whats-bonaires-nature-worth-2011-2012

4.5.2 - Social and cultural values

i) the site provides a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland ☑

Description if applicable

The entire site is part of the Bonaire Marine Park which is listed as a potential Unesco World Heritage site.

ii) the site has exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland ☐

iii) the ecological character of the wetland depends on its interaction with local communities or indigenous peoples ☐

iv) relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland ☐

4.6 - Ecological processes

<no data available>

5 - How is the Site managed? (Conservation and management)

5.1 - Land tenure and responsibilities (Managers)

5.1.1 - Land tenure/ownership

Public ownership

Category	Within the Ramsar Site	In the surrounding area
Local authority, municipality, (sub)district, etc.	☑	☑

Provide further information on the land tenure / ownership regime (optional):

Public Entity of Bonaire (purchased in 1999 for the purpose of conservation)

5.1.2 - Management authority

Please list the local office / offices of any agency or organization responsible for managing the site:

STINAPA Bonaire
P.O. BOX 368, Bonaire, Dutch Caribbean

Headquarter visitor's address:
Barcadera 10, Bonaire, Dutch Caribbean

Provide the name and/or title of the person or people with responsibility for the wetland:

Director STINAPA: Herman Sieben and Manager Bonaire National Marine Park: Wijnand de Wolf; marinepark@stinapa.org

Postal address:

STINAPA Bonaire
P.O. BOX 368, Bonaire, Dutch Caribbean

E-mail address:

director@stinapa.org

5.2 - Ecological character threats and responses (Management)

5.2.1 - Factors (actual or likely) adversely affecting the Site's ecological character

Biological resource use

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Fishing and harvesting aquatic resources	Low impact	Low impact	☑	No change	☐	No change

Human intrusions and disturbance

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Recreational and tourism activities	Low impact	Medium impact	☑	increase	☐	No change

Invasive and other problematic species and genes

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Invasive non-native/ alien species	Medium impact	High impact	☑	increase	☑	increase
Problematic native species	Medium impact	High impact	☑	increase	☑	increase

Climate change and severe weather

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Habitat shifting and alteration	Low impact	High impact	☑	increase	☑	increase

Please describe any other threats (optional):

Klein Bonaire is a low lying flat island, which makes it especially vulnerable to climate change induced sea level rise. Global sea-level rise projections range between 0.18-0.59m by 2100 (IPCC, 2007). The Caribbean region however may experience 25% greater sea-level rise than the global average with suggestions up to 1,6m. This will among others threaten the sea turtle nesting beaches (Cheetham 2012, Debrot and Bugter 2010).

The 'Salinas' provide food for flamingos based on their annual cycle of salinities ranging from brackish to hypersaline conditions, as required for healthy populations of brine shrimp and brine fly (De Boer, 1979). Leaky Salinas (with a too large inflow of seawater) do not produce effective hypersaline conditions. Therefore sea level rise will threaten the functioning of these flamingo feeding areas (Debrot and Bugter 2010).

The fringing reefs are zoned benthic communities and form an important coastal defense against waves. They are already quite vulnerable to extreme weather (Meyer et al., 2003; Bries et al., 2004) and will only become more so with greater water depth in shallow areas (Debrot and Bugter 2010).

5.2.2 - Legal conservation status

National legal designations

Designation type	Name of area	Online information url	Overlap with Ramsar Site
National Park	Bonaire National Marine Park	http://stinapabonaire.org/bonair e-national/	whole

Non-statutory designations

Designation type	Name of area	Online information url	Overlap with Ramsar Site
Important Bird Area	Klein Bonaire	http://www.birdlife.org/datazone /userfiles/file/IBAs/CaribSitePD Fs/AN012.pdf	whole

5.2.3 - IUCN protected areas categories (2008)

Ia Strict Nature Reserve ☐

Ib Wilderness Area: protected area managed mainly for wilderness protection ☐

II National Park: protected area managed mainly for ecosystem protection and recreation ☑

III Natural Monument: protected area managed mainly for conservation of specific natural features ☐

IV Habitat/Species Management Area: protected area managed mainly for conservation through management intervention ☐

V Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation ☐

VI Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems ☐

5.2.4 - Key conservation measures

Legal protection

Measures	Status
Legal protection	Implemented

Habitat

Measures	Status
Re-vegetation	Partially implemented
Habitat manipulation/enhancement	Partially implemented

Species

Measures	Status
Control of invasive alien plants	Partially implemented
Control of invasive alien animals	Proposed

Human Activities

Measures	Status
Research	Implemented
Regulation/management of recreational activities	Implemented

Other:

The Structure Plan of Bonaire incorporates a buffer zone of 500 meters extending from the high water mark around the Ramsar Site. It is needed to control developments, which can have a negative impact on the Ramsar Site. The buffer zone is divided in two areas namely: a 0–100 m designated setback zone; and a 100 – 500 m zone allowing for controlled use. This bufferzone is an official part of the Ramsar Site.

5.2.5 - Management planning

Is there a site-specific management plan for the site? Yes

Has a management effectiveness assessment been undertaken for the site? Yes ○ No ◉

If the site is a formal transboundary site as indicated in section Data and location > Site location, are there shared management planning processes with another Contracting Party? Yes ○ No ◉

URL of site-related webpage (if relevant): http://www.bmp.org/

5.2.6 - Planning for restoration

Is there a site-specific restoration plan? Yes, there is a plan

5.2.7 - Monitoring implemented or proposed

Monitoring	Status
Animal species (please specify)	Implemented

Nesting sea turtles

6 - Additional material

6.1 - Additional reports and documents

6.1.1 - Bibliographical references

For more information see the Dutch Caribbean Biodiversity Database (www.dcbd.nl):

BirdLife International, 2012. Important Bird Areas factsheet: Klein Bonaire, Bonaire. Downloaded from http://www.birdlife.org on 27/01/2012.
BirdLife International, 2008. Important Bird Areas in the Caribbean: Key sites for Conservation. Cambridge, UK: BirdLife International. (BirdLife Conservation Series No. 15).
Brauman et al., 2007. The Nature and Value of Ecosystem Services: An Overview Highlighting Hydrologic Services. Annual Review of Environment and Resources.32:6.1–6.32.
Bries, J.M., A.O. Debrot and D.L. Meyer, 2004. Damage to the leeward reefs of Curaçao and Bonaire, Netherlands Antilles from a rare storm event: Hurricane Lenny, November, 1999. Coral Reefs 23: 297-307.
Cheetham, Jennifer, 2012. The impacts of sea-level rise on the index nesting beach on Klein Bonaire for three species of Sea Turtle. Sea Turtle Conservation Bonaire. 50p.
De Boer, Bart A., 2010.Our Coral Reef. Curacao, Bonaire, Aruba. Stichting Dierenbescherming Curacao. 175p.
De Boer, B.A. 1979. Flamingos on Bonaire and in Venezuela. Stinapa Doc. Ser. 3., Carmabi, Curaçao.
Debrot, A. O., 1997. Klein Bonaire: brief biological inventory. Carmabi Reports 1997, 17 pp, + app.
Debrot, A. O., 2003. The freshwater shrimps of Curaçao, West Indies (Decapoda, Caridea). Crustaceana 76: 65-76.
Debrot, Dolfi, 2013. Reforestation Initiatives on Klein Bonaire and Klein Curaçao. Bionews 07. P6-7.
Debrot, A.O. and R. Bugter, 2010. Climate change effects on the biodiversity of the BES islands; Assessment of the possible consequences for the marine and terrestrial ecosystems of the
Dutch Antilles and the options for adaptation measures. Wageningen, Alterra, Alterra-report 2081; IMARES-report C118/10. 36 blz.
Debrot, A.O. et al., 2017. Description of the Outstanding Universal Value (OUV) of the Proposed Marine Nomination Properties of the Bonaire and Curaçao Marine Parks (BCMP). Wageningen Marine Research report C003/18 184 pp.
De Freitas et al., 2005. Landscape ecological vegetation map of the island of Bonaire (Southern Caribbean). Carmabi Foundation. 64p.
Florijn, Sijko & Theo Visser, 1988. De zoetwatergarnalenvan Bonaire: een survey en de mogelijkheden tot kweek: 1-86. (M.Sc. Thesis, University of Amsterdam, The Netherlands).
IPCC, 2007. IPCC Fourth Assessment Report: Climate Change 2007 (AR4). Interngovernmental Panel on Climate Change.
IUCN, 2011. Coral Reef Resilience Assessment of the Bonaire National Marine Park, Netherlands Antilles. IUCN, Gland, Switzerland, p. 51.
Meyer, D. L., et al., 2003. Preservation of in situ reef framework in regions of low hurricane frequency: Pleistocene of Curaçao and Bonaire, southern Caribbean. Lethaia 36: 273-285.
Min. EZ, 2013. What's Bonaire's Nature Worth? The Economics of Ecosystems and Biodiversity on Bonaire. VU Amsterdam & WICKS. 12p.
Valdés, Ángel, 2009. A new species of Trapania Pruvot-Fol ... (etc.) Caribbean Journal of Science, Vol. 45, No. 1: 8-14.

6.1.2 - Additional reports and documents

i. taxonomic lists of plant and animal species occurring in the site (see section 4.3)
<no file available>

ii. a detailed Ecological Character Description (ECD) (in a national format)
<no file available>

iii. a description of the site in a national or regional wetland inventory
<no file available>

iv. relevant Article 3.2 reports
<no file available>

v. site management plan
<1 file(s) uploaded>

vi. other published literature
<no file available>

6.1.3 - Photograph(s) of the Site

Please provide at least one photograph of the site:

Turtle nesting beach (*Rene Henkens, 24-06-2011*)

Karst well at Klein Bonaire (*Dolfi Debrot, 6-2-2010*)

Bourreria succulenta, planted in a reforestation project in 2006 at Klein Bonaire. (*Dolfi Debrot, 23-6-2013*)

6.1.4 - Designation letter and related data

Designation letter
<1 file(s) uploaded>

Date of Designation	1980-05-23