Bulletin of Regional Natural History
Formerly Bollettino della Società dei Naturalisti in Napoli

Preliminary contribution to the knowledge of aquatic macrophytes and trophic status in the park of the Royal Palace of Caserta

Salvatore Viglietti[1], Giuseppina Merola[2] , Loredana Pascarella[2], Paola Viola[3,4]

DOI https://doi.org/10.6093/2724-4393/10328

***Correspondence:**
s.viglietti@arpacampania.it

Affiliation:
[1]ARPAC Provincial Department of Benevento.
[2] ARPAC Provincial Department of Caserta.
[3] MIC Reggia of Caserta
[4]UNIBO Distal

Conflict of Interest: The authors declare that they have no conflict of interest.

Financial Disclosure Statement: The authors declare that no specific funding was received for this work.

Submitted: 24 Jul. 2023
Revised: 22 Aug. 2023
Accepted: 25 Aug. 2023
Published: 11 Oct. 2023

Associate Editor: Marco Guida

Abstract

La "Reggia di Caserta" (Caserta Royal Palace) including the park and the gardens are certainly one of the major tourist destinations in Campania (Italy). The waters of the Park have the undoubted and peculiar characteristic of reaching the Park through an almost entirely underground route of 38 km. The collection of water takes place from numerous springs traced by Vanvitelli at the foot of Monte Taburno, in the province of Benevento. This study confirms the high quality of the water, and the presence of fifteen plant species, including six phanerogams, two mosses and seven algae.

Keywords: Campania, Royal Palace, Caserta, macrophytes, IBMR, Carolino Aqueduct

Riassunto

La Reggia di Caserta, compresi il suo parco e i suoi giardini, è sicuramente una delle maggiori mete turistiche della Campania. Le acque del Parco hanno l'indubbia e peculiare caratteristica di arrivare al Parco attraverso un percorso quasi interamente sotterraneo di 38 km. La captazione dell'acqua avviene da numerose sorgenti rintracciate da Vanvitelli alle falde del Monte Taburno, in provincia di Benevento. Questo studio conferma l'alta qualità dell'acqua, e la presenza di quattordici specie di piante, tra cui cinque fanerogame, due muschi e sette alghe.

Parole chiave: Campania, Reggia, Caserta, macrofite, IBMR, Acquedotto Carolino

How to cite

S. Viglietti, G. Merola , L. Pascarella, P. Viola (2023). Preliminary contribution to the knowledge of aquatic macrophytes and trophic status in the park of the Royal Palace of Caserta. Bulletin of Regional Natural History (BORNH), Bollettino della Società dei Naturalisti in Napoli. Vol. 3, n. 2, pp. 16 - 26 ISSN: 2724-4393.

Introduction

The Carolino Aqueduct, so named in honor of King Carlo di Borbone, is a masterpiece of hydraulic engineering, that has strongly characterized the territory of Campania region. It is one of the most impressive and significant achievements carried out by the House of Borbone thanks to the genius of the architect Luigi Vanvitelli. Designed to ensure an abundant water supply to the Royal Palace and the great city that would have arisen around it, the Aqueduct was intended to enhance the water supply of the city of Naples and also serve the *real delights* (Bagordo in Cundari, 2005). This cutting-edge infrastructure traversed mountainous and river landscapes from the territory of Benevento to the hills and fertile plains of Terra di Lavoro (Fig. 1).

The aqueduct has a length of approximately 38 km, a width of 1.20 meters, and a height of 1.30 meters, being completely underground except for the parts passing over bridges. To complete its construction, five tunnels had to be built. The route is marked by 67 torrini, characteristic square-shaped constructions with a pyramidal roof, designed as ventilation points and access points for inspection (Patturelli, 1826). Its water source level is 254 meters, while the level at the waterfall of the Royal Palace is 203 meters, resulting in an average slope of ½ mm per meter along the channel. The construction works started in 1753 and were completed in 1770, divided into three sections, with the first two being built simultaneously. These sections allowed the capture of water from numerous springs identified by Vanvitelli at the foothills of Monte Taburno, in the province of Benevento. Near the Fizzo springs, where the path of the Carolino Aqueduct begins, two collectors were built to channel the water into two reservoirs for storage and purification, equipped with an overflow mechanism.

The waters of the park therefore have the undoubted peculiarity of arriving through the Carolino aqueduct from springs collected at the source and brought to the Royal Palace through an almost entirely underground route.

The construction of the Park started in 1753 and continued for over fifty years. During the first phase, between 1753 and 1773, the part on the floor closest to the Palace which includes the Gran Parterre with the large expanses of lawn surrounded by groves, and the so-called *Bosco Vecchio* (Old Forest) were arranged. In 1773, after the death of Luigi Vanvitelli, the works in the park slowed down and in 1777 Luigi's son Carlo, presented to Ferdinando IV di Borbone (Ferdinand IV of Bourbon) a new design, in which his father's original idea was scaled down: Luigi's design was maintained in its main lines and the so-called "Via

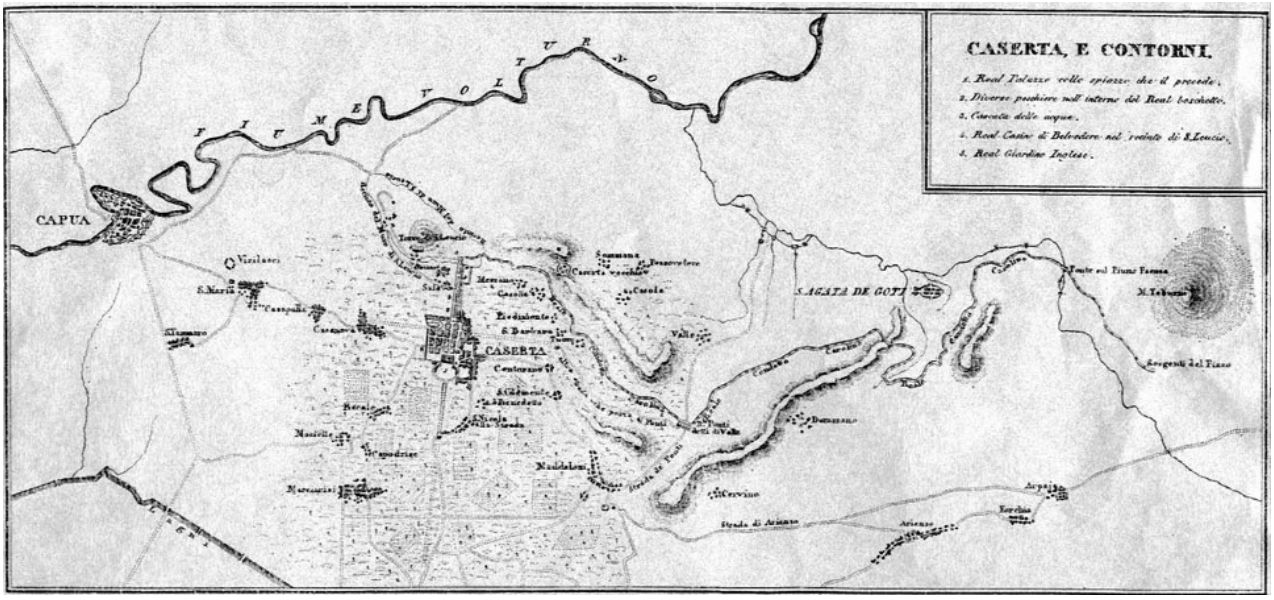

Figure 1: The Acquedotto Carolino from Fizzo springs to Reggia di Caserta (Patturelli, 1826).

d'Acqua" (Fig. 2) was built, a spectacular sequence of waterfalls, fountains, pools and basins arranged along a longitudinal path in a slight slope about 3 km long, up to Briano mountain. The monumental fountains in sequence are: The "Dolphins Fountain", in which the water comes out of the mouths of three large sea monsters carved in stone; "Aeolus Fountain", a large exedra in which there are several caves that evoke the home of the winds, represented by statues of zephyrs. The statue of Juno on a chariot pulled by two peacocks, shown in the act of asking Aeolus to unleash his winds against Aeneas's ships, was never placed in its intended location; "Ceres Fountain", a tribute to the fertility of Sicily, with the scenic layout arranged on three levels; "Fountain of Venus and Adonis", which evokes the myth as narrated by Ovid in his "Metamorphoses". Luigi Vanvitelli was responsible for its innovative hydraulic arrangement and the arrangement of the overlapping pools, all able to be emptied independently into a lateral underground channel to allow cleaning and repairs. Below the waterfall of the Briano Mountain, in a basin known as "The Bath of Diana", two important marble groups depict the myth of Diana and Actaeon, also taken from Ovid's "Metamorphoses" (Bagordo, 2009). Here the water, coming from 38 km away, makes a jump of 80 meters. A careful perspective study has ensured that the pools, thanks to the slope of the site and the alternation with the grasslands, are clearly visible from the entrance vestibule of the Royal Palace. The Park covers an area of about one hundred hectares, to which later were added the twenty-three of the English Garden, forming an articulated and evocative landscape system (Viola. 2022). Knowledge of the botanical aspects of the park is currently rather lacking, limited to the inventory of cultivated (or natural) ornamental species starting from the construction of the complex and the annexed park in the 18th century. During the nineteenth century there are several contributions by Nicola Terracciano (1862, 1864, 1872, 1876, 1887), while in more recent times studies have

Figure 2: Royal Park: "Aeolus Fountain" and "Waterway" (© Reggia di Caserta).

been carried out relating to specific taxa such as orchids (Croce, 2021).

The present work is at sampling and determining the macrophytic component, calculating for knowledge purposes the IBMR index (Index Biologique Macrophyitique en Riviere) and RQE (Ecological Quality Report) (AFNOR, 2003) and comparing the results with the chemical and microbiological analysis of waters (APAT, 2005, 2014) drawn in the Park of the Royal Palace of Caserta. The choice to use the IBMR index was made in line with the requirements of the European Water Framework Directive 2000/60/EC, transposed in Italy with the Law D.lgs. 152/2006 (Decreto Legisativo 3 aprile 2006, n. 152) and technically implemented by DM 260/2010 (Decreto Ministeriale 8 Novembre 2010 n. 260) which established the index's use for its demonstrated validity and applicability in Italy Directive 2000/60/EC (Direttiva 2000/60/CE).

Aquatic macrophytes are a group defined on an ecological-functional basis including the macroscopically visible plants present in inland waters. The communities covered by this protocol consist of phanerogams, pteridophytes, bryophytes and algae of visible size. The macrophytic community represents an important bioindicator of the state of health of water bodies, in particular of their trophic state (Minciardi et al., 2009; ISPRA, 2014). This preliminary study confirms the high water quality and the presence of fourteen species of aquatic plants.

Materials and method

The sampling of plant was carried out using "Protocollo di campionamento ed analisi per le macrofite delle acque correnti" (APAT, 2007). The determination of phanerogams

was carried out using Pignatti (1982; 2019) and https://dryades.units.it. The nomenclature of the species follows that proposed by Pignatti (2019). For algae determination, reference was made to Laplace-Treyture et al. (2014) and Bellinger and Sigee (2015). In this case, in accordance with the requirements for calculating the IBMR index, identification was kept at the genus level (Minciardi et al., 2009). For mosses Contini Pedrotti (2001) was used.

The IBMR index was calculated on the qualitative and quantitative samplings (UNI EN 14184, 2004) of 21 June 2022, using data from the initial part of the watercourse within the Park, from the last (accessible) section of the initial waterfall under the "Bosco di San Silvestro" to the fountains of "Diana, Atteone, and Cerere", and the connecting path. The list of species was integrated in the sampling made on 17 April 2023.

The coverage of the plants in percentage terms over the total area of the tanks and channels is at the lower limit required by the method, which is 5% coverage (APAT, 2014). The artificial nature of the site itself hardly fits into a "standard" application of the Index (Minciardi et al., 2009, 2014). Other factors that affect its application are the substrate, which, where present, comes from the transport and deposition of material in the pools of the fountains, or where the speed of the current allows the accumulation. In our case the macrotype of reference chosen was "Very small and small rivers of the Mediterranean geographical area", whose comparative value for the calculation of RQE is 12.5 (table 4.1/b DM 260/2010).

The sampling of waters aimed at the determination of chemical parameters and field measurements of the basic chemical-physical parameters was carried out using SNPA Guidelines (2018).

The determination of chemical parameters such as Total Suspended Solids, COD, Nitric Nitrogen, Ammonia Nitrogen, Nitrous Nitrogen and microbiological parameter Escherichia coli, were carried out using APAT, CNR, IRSA Analytical Methods (2003, 2005, 2014). BOD_5 was determined using Standard Methods 5210 D (Young et al., 2004). The determination of Metals and Total Phosphorus were carried out using UNI EN ISO Standards 17294-2:2016 (2016).

Results and discussion

The aquatic species found in the park during two samplings, amount to a total of 15 taxa, including seven algae, two bryophytes and six phanerogams. One species, *Nasturtium officinale*, was only found on the side of the "Diana and Atteone" fountain, along the small slope to the right of the fountain, in an environment constantly moist due to leaks from the aqueduct. However, it was not subsequently found in the channels and other fountains. This species was not considered in the calculation of the IBMR index, as well as *Cladophora* sp., which was found downstream and only during the second survey. In addition to the collection and determination of the plants present, their coverage has been estimated as a percentage of the total surface area of the park's basins and channels. Two water samples have been taken for chemical and microbiological analysis, one upstream in the fountain of Diana and Atteone and one downstream, at the end of the channel.

Taxa list

Algae

Binuclearia sp. - A genus of algae found in still and cold waters; it is the less common among the algae in the Park. It is often found associated with other algae.

Chara vulgaris L. - Found in stagnant or weakly flowing waters, this genus is highly dependent on the trophic conditions of the water and sensitive to pollution. In the Diana and Atteone fountain, it forms an almost continuous submerged hilly carpet, occupying almost all the space and inhibiting the presence of other species, which are confined to only a few small areas. *Chara vulgaris* is quite widespread in Campania (Viglietti, unpublished data), the absence (Bazzichelli et al., 2009) of reports is probably due to the lack of studies on the macrophytes present in the rivers of the region. Populations of this species can be traced, for example, in the Picentino river or in the Fortore river (Viglietti, unpublished data).

Spirogyra sp. - Present in stagnant and slow-flowing waters as well as in flowing waters. It is the second most abundant algae in the Park, surpassed only by *Chara vulgaris*.

Draparnaldia sp. - Found along the edges of the channels, the species found in the first sampling in May 2022 was not found in the April 2023 sampling.

Vaucheria sp. - Found on the waterfalls that connect different sections of the channels in the Park.

Cladophora sp. - Found along the walls of the canal. In the waters of the Park, it does not form relevant populations in terms of biomass and was not found in the first sampling.

Nostoc sp. - Abundant on the waterfalls that connect the sections of the various channels of the Park. In some situations, epilytic populations of *Nostoc* are severely limited by the nitrogen content of the medium.

Briophytes

Leptodictyum riparium (Hedw.) Warnst. - Present along the waterfalls that connect the various sections of the channels.

Fontinalis antipyretica Hedw. – In the upper part of the Park, before the Fountain of Diana and Actaeon.

Phanerogams

Apium nodiflorum (L.) Lag. - Slow flowing water. Fountain of Ceres. The accumulation of a minimum of substrate allows the growth of the species in the fountains of the Park.

Myriophyllum spicatum L. - Slow-flowing waters. Fountain of Diana and Actaeon, Fountain of Ceres. These are quite limited populations by the smallness of the substrate.

Mentha aquatica L. – Species quite widespread in Campania, in the Park present only on the waterfall that carries the fountain of Diana and Actaeon and in the constantly wet area beside the same fountain.

Nasturtium officinale R.Br. – Present only on the side of the fountain of Diana and Actaeon, species not used for the calculation of the IBMR index, not being present in tanks and channels.

Potamogeton crispus L. - Slow flowing waters. Fountain of Diana and Actaeon, Fountain of Ceres. As for the myriophyll the species grows with small populations exploiting the little substratum available.

Veronica anagallis-aquatica L. subsp. *anagallis-aquatica* - present only at the

base of the first waterfall after the fountain of Cerere.

Chemical analysis

For this study, since the origin of the waters is known and considering that they do not undergo appreciable variations during the year (since the Carolina aqueduct is buried throughout its entire course), it can be assumed that the results are reliable even in the medium term, net of any exceptional and unpredictable situations. Therefore, while analyzing parameters required by the regulations (DM 260/2010) to establish the chemical quality of a water body, we were limited to a single sampling, on 17 April 2023 deemed suitable for good weather conditions, also in the days preceding the sampling, and such as not to alter the normal water quality of the Park with abnormal inputs. Two water samples were taken, the first in the fountain of Diana and Actaeon, the second downstream at the end of the channel. The values found (Table 1) show a low level of nutrients (between 0.01 and 0.05 mg/l for total phosphorus and nitrous nitrogen), a very low value of *Escherichia coli* (microbiological contamination index of faecal origin), a low conductivity (360 µs/cm) and a basic pH (equal to 8.4). The values found show a very low level of metals: lower than 0.01 mg/L for Aluminium, Total Chromium, Iron, Manganese, Lead, Copper, Zinc and lower than 0.001mg/L for Cadmium. The microbiological parameter Escherichia coli was found between 4 and 6 UFC/100 mL. The analytical framework shows good water quality.

For comparison, the most frequently ascertained values in surface water bodies located in the Province of Caserta ARPAC, 2006) are 400 - 500 µs/cm for conductivity, while the pH can vary from 6 to 8, depending on many factors such as, for example, the characteristics of the soil and surrounding rocks, as well as the presence of wastewater inputs.

IBMR and EQR Index

The calculation of the IBMR index, made to evaluate the trophic level of water gave for the sampling of 21 June 2022 a value of 11.90, which corresponds to a RQE of 0.95 and therefore to a value "average" of trophic and an "elevated" ecological quality.

The results of the analysis showed the high quality of the waters of the Reggia, excluding the presence of pollutants along the route of the Carolinian aqueduct.

Regarding aquatic habitat, the characteristics that a surface water must possess to be considered "suitable" for the life of fish, include pH values between 6 and 8, and nutrient concentrations close to 0.1 mg/l for the parameter Total phosphorus and 1 mg/l for Nitrous nitrogen.

The values found show the presence of trace metals, between lower than 0.01 for Aluminum, Total Chromium, Iron, Manganese, Lead, Copper, Zinc and lower than 0.001 for Cadmium. The values for the microbiological parameter Escherichia coli are also extremely low.

The analytical framework shows good water quality, highlighting the absence of anthropic impacts on the investigated sections.

The plants present, however, have given interesting results. Most of the species present also tolerate fairly high nutrient levels, but in all cases, they are always euriecious species. Table 2 shows the values of the coefficients Csi and Ei for all the entities found, it is possible to note that the

Table 1: Water quality at sampling stations.

Parameters	Unit	Sampling station	
		Fountain of Diana and Actaeon	End of Channel
pH	-	8,46	8,44
Conductivity	µs/cm	347	360
Total Suspended Solids (TSS)	mg/L	4	4
BOD5	mg/L	<1	<1
COD	mg/L	<10	<10
Nitric Nitrogen (NO_3–N)	mg/L	2,32	2,14
Ammonia Nitrogen (NH3 – N)	mg/L	<0,02	<0,02
Nitrous Nitrogen (NO2 – N)	mg/L	<0,05	<0,05
Total Phosphorus(TP)	mg/L	<0,01	<0,01
Aluminium	mg/L	<0,01	<0,01
Cadmium	mg/L	<0,001	<0,001
Total Chromium	mg/L	<0,01	<0,01
Iron	mg/L	<0,01	<0,01
Manganese	mg/L	<0,01	<0,01
Lead	mg/L	<0,01	<0,01
Copper	mg/L	<0,01	<0,01
Zinc	mg/L	<0,01	<0,01
Escherichia coli	UFC/100 mL	7	6

only typical species of oligotrophic waters have a coefficient Ei equal to 3, that is, stenoecious species, the others always have a value Ei of 1 or maximum 2.

The study of the aquatic macrophytes of the waters of the Royal Park of Caserta has allowed to have a picture of the plants in the absence of environmental pressures. Despite low nutrient values, the trophic index IBMR did not reach the expected reference value for a low environmental pressure lowland water body. The RQE value is a high ecological quality indicator. It is believed that the peculiar characteristics of the site, characterized by the high artificiality and the difference in substrate present in the tanks and absent in the channels, has made the index difficult to apply, so that at very low chemical values the present flora has occupied the available ecological niches exploiting the often high levels of tolerance to different environmental conditions, in our case a low level of nutrients.

Table 2: Values of the coefficients of sensitivity (Csi) and stenoecious (Ei) of all the taxa present according to the attributions used for the calculation of the IBMR index.

taxa	Csi	Ci
Binuclearia sp. Wittrock	14	2
Chara vulgaris L.	13	1
Cladophora glomerata. Kützing	6	1
Draparnaldia sp. Bory de St Vincent	18	3
Nostoc sp. Vaucher	9	1
Spirogyra sp. Link	10	1
Vaucheria sp. De Candolle	4	1
Leptodictyum riparium (Hedw.) Warnst.	5	2
Fontinalis antipyretica Hedw.	10	1
Apium nodiflorum (L.) Lag.	10	1
Mentha acquatica L.	12	1
Myriophyllum spicatum L.	8	2
Nasturtium officinale R.Br.	11	1
Potamogeton crispus L.	7	2
Veronica anagallis-acquatica L.	11	2

In conclusion, we can affirm that the waters of the Park of the Royal Palace of Caserta preserve, along the way, the high quality that distinguishes them at the source, the springs of Fizzo on Mount Taburno and host a good level of biodiversity.

Furthermore, due to the very specific characteristics of the site, the result could contribute to perfecting the application of the method in the Mediterranean ecoregion (Minciardi et al., 2009).

References

AFNOR (2003). Qualité de l'eau : Détermination de l'indice biologique macrophytique en riviére (IBMR) – Association Française de Normalisation T90-395, 28.

APAT, CNR, IRSA, 2003. Analytical Methods for waters Manuali e Linee Guida 29/2003, Agenzia per la Protezione dell'Ambiente e per i Servizi Tecnici (APAT), Istituto di Ricerca sulle Acque del Consiglio Nazionale delle Ricerche (IRSA-CNR), Rome, Italy.

APAT, CNR, IRSA, 2005. Analytical Methods for waters. Manuali e Linee Guida. Agenzia per la Protezione dell'Ambiente e per i Servizi Tecnici (APAT), Istituto di Ricerca sulle Acque del Consiglio Nazionale delle Ricerche (IRSA-CNR), Rome, Italy.

APAT (2007). Protocollo di campionamento ed analisi per le macrofite delle acque correnti. In "Metodi Biologici per le acque. Parte I". Manuali e Linee Guida. Agenzia per la Protezione dell'Ambiente e per i

Servizi Tecnici (APAT), Istituto di Ricerca sulle Acque del Consiglio Nazionale delle Ricerche (IRSA-CNR), Rome, Italy.

APAT, CNR, IRSA, 2014. Analytical Methods for waters. Manuali e Linee Guida. Agenzia per la Protezione dell'Ambiente e per i Servizi Tecnici (APAT), Istituto di Ricerca sulle Acque del Consiglio Nazionale delle Ricerche (IRSA-CNR), Rome, Italy.

ARPA CAMPANIA (2006). Report Acqua, il monitoraggio in Campania 2002-2006.

Bagordo G.M. (2005). Problematiche e soluzioni del sistema idrico del Parco, in C. Cundari, Il Palazzo reale di Caserta (Roma 2005), pp. 211-216.

Bagordo G.M. (2009) Le architetture per l'acqua del Parco di Caserta, Aracne Editrice, Roma.

Bazzichelli G., Abdelahad N. (2009). Flora analitica delle Caroficee. Università La Sapienza. Editrice Sapienza, Roma.

Bellinger E,G ,Sigee D. C. (2015). Freshwater Algae: Identification, Enumeration and Use as Bioindicators, 2nd Edition. Wiley-Blackwell 304 pp.

Cortini Pedrotti C. (2001). Flora dei muschi d'Italia. Ed. Antonio Delfino, Vol I–II 1235 pp.

Croce A., Borzacchiello V., Perillo R. (2021). Le orchidee dei monti Tifatini (Campania). GIROS Orch. Spont. Eur. 64: 99-121.

Decreto Legislativo 3 Aprile 2006, n. 152. Norme in materie ambientali. Gazzetta Ufficiale – Supplemento ordinario n. 88 del 14 aprile, pp 1-172.

Decreto Ministeriale 8 novembre 2010, n. 260. Regolamento recante i criteri tecnici per la classificazione dello stato dei corpi idrici superficiali, per la modifica delle norme tecniche del decreto legislativo 3 aprile 2006, n. 152, recante norme in materia ambientale, predisposto ai sensi dell'articolo 75, comma 3, del medesimo decreto legislativo. (11G0035).

Direttiva 2000/60/CE Del Parlamento Europeo e del Consiglio del 23 ottobre 2000 che istituisce un quadro per l'azione comunitaria in materia di acque. Gazzetta Ufficiale delle Comunità Europee L 327/2, 22.12.2000: 1-71 (available from http://europa.eu/scadplus/leg/it/lvb/l28002b.htm; ultima consultazione 07/11/07).

Laplace-Treyture C., Peltre M.C., Lambert E., Rodriguez S., Vergon J.P., Chauvin C. (2014). Guide pratique dedétermination des algues macroscopiques d'eau douce et de quelques organismes hétérotrophes. Version électronique (pdf). Les Éditions d'Irstea Bordeaux, Cestas, 204 p.

Minciardi M.R., Spada C.D., Rossi G.L., Angius R., Orrù G., Mancini L., Pace G., Marcheggiani S., Puccinelli C. (2009). Metodo per la valutazione e la classificazione dei corsi d'acqua utilizzando la comunità delle Macrofite acquatiche. Rapporto Tecnico ENEA RT/2009/23/ENEA: 35 pp.

Minciardi M. R., Spada D., Abati S., Ciadamidaro S., Fiorenza A. (2014). 2030. Protocollo di campionamento e analisi delle macrofite dei corsi d'acqua guadabili. In Metodi Biologici per le acque superficiali interne, Delibera del Consiglio Federale delle agenzie Ambientali. Seduta del 27 novembre 2013 Doc. n. 38/13CF. Manuali e Linee guida 111/2014 ISPRA SNPA.

Patturelli F. (1826). Caserta e San Leucio descritti dall'arch. Ferdinando Patturelli, Napoli Stamperia Reale.

Pignatti S. (1982). Flora d'Italia. Edagricole, 3 voll.

Pignatti S. (2019). Flora d'Italia. Edagricole, 4 voll.

SNPA (2018). Rapporto Ambiente N. 07/2019, Roma 2019 (Available from https://www.snpambiente.it/2019/02/27/rapporto-ambiente-snpa-edizione-2018/)

Terracciano N. (1862). Intorno a certe piante da Serra, poste a pien'aria nella primavera del 1863 nel Giardino Reale di Caserta. Nobile e C., Caserta.

Terracciano N. (1864). Intorno a certe piante poste a pien'aria nella Primavera del 1863 nel Giardino Reale di Caserta. Nobile e C., Caserta

Terracciano N. (1872). Relazione intorno alle peregrinazioni botaniche fatte per disposizione della deputazione provinciale di Terra di Lavoro in certi luoghi della provincia dal dottor N. Terracciano. Nobile e C., Caserta

Terracciano N. (1876) Cenno intorno al Giardino Botanico della Real Casa in Caserta ed a certe piante rare che vi si coltivano. Nobile e C., Caserta

Terracciano N. (1887). La Dicksonia Billardieri Von Mueller del giardino botanico della Real casa in Caserta, in Atti del Real Istituto d'Incoraggiamento di Napoli 27 aprile 1887.

UNI EN 14184, 2004. Linee guida per la valutazione delle macrofite acquatiche nelle acque correnti.

Viola P. (2022). The Gardens of the Royal Palace of Caserta: the dream of Luigi Vanvitelli. Creation and evolution of an extraordinary Historical Garden – Wilanów Studies – a scientific periodical of the Museum of King Jan III's Palace at Wilanów 2022, Volume XXIX ISSN: 0137-7329 | E-ISSN: 2720-0116.

Young JC, Cowan RM. (2004) Respirometry for environmental science and engineering. Springdale (AR): SJ Enterprises.

Archival sources and handwritten fonts from the historical archive of the Royal Palace of Caserta

Catalogo delle piante del Giardino Inglese 28.4.1840 - ASRC, Serie I.R.A. b. 1899 fasc. 367.

Catalogo delle piante moltiplicate che si vendono nel Real Giardino Inglese di Caserta, Napoli 1844.

Catalogo delle piante moltiplicate che si vendono nel Real Giardino Inglese di Caserta, Napoli 1852.

Catalogo delle piante vendibili nel Giardino Reale all'Inglese in Caserta, Caserta 1873 (trimestrale).

Elencus plantarum Regii viridarii Casertani, Neapolis 1816, Giovanni Graefer 1816.

Elenchus plantarum Regii viridarii Casertani ad annum 1827, senza firma.

Notamento delle piante più rare esistenti nella Vaseria del Real Giardino Inglese in maggio 1839 - ASRC I.R.A. b. 1892 fasc. 578.

Sancio A. (1826) Platea de fondi, beni e rendite che costituiscono l'amministrazione del Real Sito di Caserta, Stato di Caserta 1826, Archivio Storico - Reggia di Caserta.