A NEW SPECIES OF *CHEILANTHES* (SINOPTERIDACEAE, PTERIDOPHYTA) FROM GRAN CANARIA (CANARY ISLANDS)

TOMÁS SÁNCHEZ VELÁZQUEZ

I.E.S. Arucas-Domingo Rivero, Departamento de Biología y Geología, c/ Camino de la Cruz, nº 22, 35412, Arucas, Gran Canaria, Canary Islands. Spain.

Recibido: noviembre 2010

Key Words: Taxonomy, *Cheilanthes*, Sinopteridaceae, Gran Canaria, Canary Islands.

Palabras Clave: Taxonomía, *Cheilanthes,* Sinopteridaceae, Gran Canaria, Islas Canarias.

SUMMARY

A new species *Cheilanthes* is described, and the difference between its basic morphological features and those of *Cheilanthes guanchica* and *Cheilanthes maderensis* are underscored on a table. Its habitat and ecology, and its state of conservation are assessed, and its morphology is characterised. A key is presented to determine all Canarian species of the genus *Cheilanthes*, including *Cheilanthes hispanica*, which possesses common taxonomic features and may occur in the Canaries.

RESUMEN

Se describe una nueva especie de *Cheilanthes* para la ciencia procedente de Gran Canaria, Islas Canarias y se resaltan en una tabla sus rasgos morfológicos básicos que difieran de *Cheilanthes guanchica* y *Cheilanthes maderensis*. También se da a conocer el hábitat y ecología, estado de conservación y son discutidos los caracteres morfológicos de diagnosis de esta especie. Asi mismo se presenta una clave para la determinación de todas las especies canarias del género *Cheilanthes* incluyendo *Cheilanthes hispanica* que puede habitar en Canarias y presenta rasgos taxonómicos comunes.

INTRODUCTION

According to HANSEN & SUNDING (1993), the genus *Cheilanthes Sw.* is represented in the Canarian archipelago by six species: three diploid [*C. pulchella* Bory & Willd., *C. maderensis* Lowe and *C. marantae* (L.) Domin subsp. *subcordata* (Cav.) Benl et Poelt.]; two tetraploid [*C. guanchica* Bolle (= *C. maderensis* x *C. pulchella*) and *C. tinaei* Tod. (= *C. hispanica* Mett. x *C. maderensis*)]; and one with both cytotypes, *C. catanensis* (Cos.) H.P.Fuchs. However, this latter species is currently considered to belong to the genus *Cosentinia* Tod.: *Cosentinia vellea*

ISSN 0211-7150

*(*Aiton) Tod. subsp*. bivalens* (Reichst.) Rivas-Mart. & Salvo (PICHI-SERMOLLI, 1985).

Apart from the cytotaxonomic studies made by VIDA *et al*. (1970, 1971), little of this genus has been investigated, since its taxonomy is complicated by the high genetic and ecological variability that it displays in its Canarian circumscription.

With this discovery, the evolutionary knowledge of this genus on the island of Gran Canaria is increased.

NEW SPECIES

Cheilanthes tirajanae* T. Sánchez Velázquez**, ***sp. nov.

Diagnosis: *Stipes dimidio superiore paucis paleis anguste oblongo-linearibus*, (0.7) 0.8-1.4 (1.7) *mm*, *pilis glanduliferis pluribus quam paleis*, *(0.1) 0.26-0.8 (1) mm longis. Lamina subtripinnatisepta, triangulari-deltoidea. Pinnae, bassales longiores, 0.8-1.2 cm, asymmetricae, ovales et petiolulatae, ceterae oblongae. Facies abaxialis laminae, paucis pilis glanduliferis multicellularibus, 0.06-0.32 mm longis, cellulis 2-7 (12). Pinnulae ovales, margine lobulato, aliquando irregulariter crenato**,** basiscopica pinnae imae pinnatisepta usque ad 0.8 mm. Sori marginales interrupti**,** pseudoindusio angusto**,** 0.4-0.6 (0.7) mm lato, membranaceo, subquadrangulare**,** margine cum ciliis glandularibus et inconspiciis**,** 0.02-0.1 mm longis**.** Sporae (42.5) 46-53 (57.5) µm diametro aequatorio exosporii, perisporio crestato, crestis irregularibus plus minusve confluentibus et paucis elementis fibrillaribus elongatis. Stomae (35) 37-46 (52.5) µm longae**.** Numerus chromosomatum diploideus, meiosi 30 bivalentibus.*

Holotypus: *Cheilanthes tirajanae* T. Sánchez Velázquez. *Habitat in Canaria Magna* (Gran Canaria *dicta*), San Bartolomé de Tirajana *in loco dicto "*Barranco de Meca", *1.475 m supra mare, loc. class. leg.*: T. Sánchez *die* 10-03-2007 (LPA: 22137). *Paratypi: ibidem*, *die* 27-03-2006 (LPA: 22138); TFC, *ibidem*, *die* 31.03.2007; ORT *ibidem*, *die* 10.3.2007*.* (Fig. 1), Icon: (Fig. 2).

Derivation: named after San Bartolomé de Tirajana, the town in the island of Gran Canaria where this species was first discovered.

Description: Rhizome short, apex covered with scales, 1.7 to 3.3 mm in length, oblong-linear, orangish-yellow. Stipe 0.5 to 6 cm in length, bright chestnut-red. covered with scales in its upper half, narrowly oblong-linear, (0.7) 0.8 - 1.4 (1.7) mm in length, almost always glandular and reddish-yellow; it has a moderate ammount of glandular hairs, (0.1) 0.26 - 0.8 (1) mm in length. Fronds up to 9 cm long, rising to form a crown. Lamina subtripinnatisect, deltoid-triangular, light green, of delicate texture and smells of cumarinia. Pinnae partially imbricated; basal pinnae are the longest, between 0.8 to 1.2 cm, asymmetric, oval and petiolated, the rest are oblong. Abaxial side of the lamina (rachis and pinnules) covered with few multicelular and glandular hairs, between 0.06 and 0.32 (0.65) mm in length, the longest in the rachis of the 1st order and between 2 and 7 (12) cells.

Figura 1.- *Cheilanthes tirajanae* T. Sánchez Velázquez.

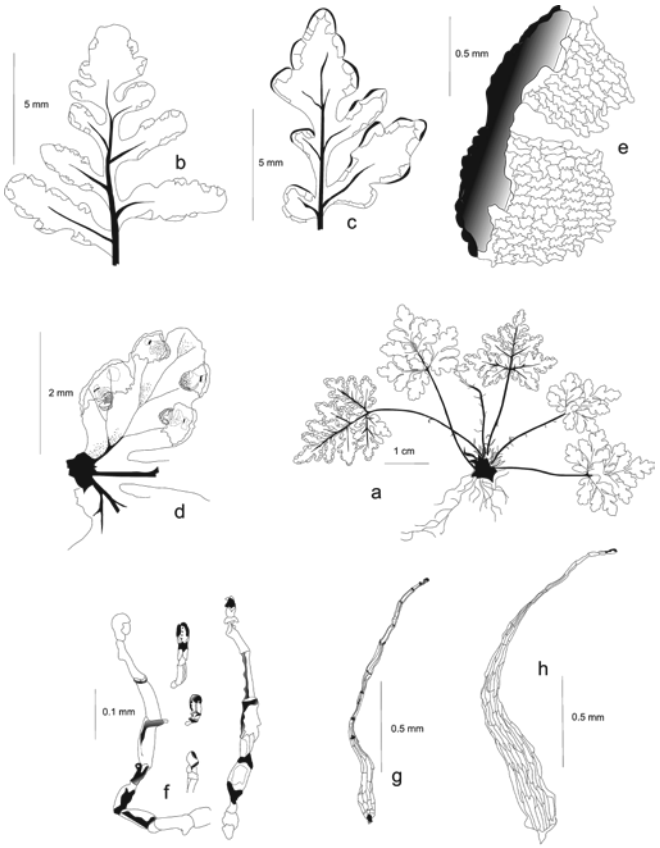

Figura 2.- Icon *Cheilanthes tirajanae* T. Sánchez Velázquez.

Pinnules are oval, margins lobed, sometimes irregularly crenated, basioscopic pinnule of basal pinnae are pinnatisect, up to 0.8 mm. Sori marginal and discontinuous, with a narrow pseudoindusium, between 0.4 and 0.6 (0.7) mm wide, membranaceous, subquadrangular, margin with papillae, sometimes glandular, between 0.02 to 0.1 mm in length. Spores have exospores with an equatorial diameter of between (42.5) 46 to 53 (57.5) µm, and the perispores are cristate with irregular cristae, which are more or less disconnected, containing sparse long rodlets (Fig. 3). Stomata vary between (35) 37 and 46 (52.5) µm in length. Diploid Chromosome number consists of 30 bivalents (Fig. 4).

Conservation status

The largest population of this species occurs in an area of 50 hectares, and includes approximately 20 individuals, each with about 3 to 6 fronds; another 6 individuals were found in the surrounding area. This area, which had been overexploited in the past by agriculture and livestock farming, is currently in the process of regaining its indigenous vegetation. Furthermore, it is included in the protected "Parque Rural del Nublo" according to *Ley 3/1998* in an amendment of the National Park rules.

Due to the above mentioned reasons, and taking into account the criteria of cataloguing threatened plants of the IUCN (IUCN, Red List Categories, 2001), this species would be considered to be in "critical danger" (CR): **D,** having an estimated population of less than 50 mature individuals.

Habitat and ecology

It generally grows on the south-western peaks of Gran Canaria, at approximately 1475 m asl. specifically on the higher grounds of the basin of Barranco de Meca, near Ayacata, in the municipality of San Bartolomé de Tirajana. It lives in humid soils and a cool environment, in low light and out of direct sunlight, in cavities under big agglomerated volcanic rocks, of the Roque Nublo type.

It is found as part of shrublands in bioclimatic belts, typically in dry mesocanarian temperatures in the *Micromerio benthami-Telinetum microphyllae* phytosociological association Sunding 1972 (RODRÍGUEZ DELGADO *et al*., 1998; DEL ARCO & RODRÍGUEZ DELGADO, 2003) "Retamar de cumbre". It is most commonly found growing with: *Euphorbia regis-jubae* Webb & Berthel., *Teline microphylla* (DC.) P.E.Gibbs & Dingwall, *Todaroa montana* Webb ex Christ, *Salvia canariensis* L., *Sideritis dasygnaphala* (Webb & Berthel.) Clos, *Echium onosmifolium* Webb and *Piptatherum coerulescens* (Desf.) P. Beauv. The most abundant pteridological flora growing in the study area is *C. guanchica* and, to a lesser extent, *C. maderensis*, *C. pulchella*, *Asplenium octoploideum* Viane & Van den Heede, *Anogramma leptophylla* (L.) Link and *Asplenium trichomanes* L. subsp. *quadrivalens* D.E. Mey.

DISCUSSION AND CONCLUSION

Until now, this new species was not recognized because it was mistaken for certain forms of *C. guanchica* that have deltoid fronds identical to those of *C. tirajanae*, as shown in the cultivated and pressed fronds of Figure 8 in VIDA *et*

al. (1971). Furthermore, these two species have other common taxonomic features,

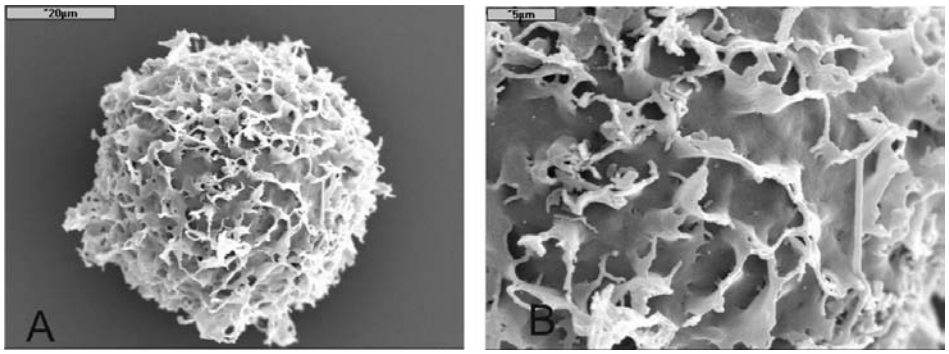

Figure **3**.- Perispores *of Cheilanthes tirajanae* T. Sánchez Velázquez.

However, there are differences which distinguish *C. guanchica* from *C. Tirajanae*, namely: the superior pinnae of the lamina of *C. guanchica* are lanceolate-linear while those of *C. tirajanae* are oblong; the pinnules of *C. guanchica* are linear or at times oval-linear, while those of *C. tirajanae* are oval. With regard to the pseudoindusium, in *C. guanchica* it is formed by fragments which are longer than they are wide, subcontinuous, between (0.4) 0.6 – 0.8 (0.9) mm wide, while in *C. tirajanae* the pseudoindusium is subquadrangular and discontinuous, between (0.3) 0.4 – 0.6 (0.7) µm wide. Furthermore, it has to be noted that both the spores and the stomata of *C. guanchica* reach lengths of approximately 3 micrometers more than the maximum length of those of *C. tirajanae*.

Additionally, on a first inspection, *C. hispanica* can be mistaken for *C. tirajanae* due to the deltoid shape of the lamina. *Cheilanthes hispanica*, found in the Iberian Peninsula, France and Northern Africa, has yet to be seen in the Canaries. It can be distinguished from *C. tirajanae* by the following biometric and morphological features:

a. Its lamina is tripinnatisect and more divided, and its pinnules are oval-lanceolate and orbicular.
b. Its pseudoindusium is green, almost without membranaceous margins, and without marginal papillae.
c. The spores are between (27.5) 34 – 42 (47.5) µm in length, and have granulated exospore and perispore.
d. The most distinguishing difference is the high density of reddish hairs, between (0.1) 0.2 – 0.7 (0.9) µm in length, which cover the abaxial side of the pinnules and rachis.

Cheilanthes tirajanae is a new diploid whose ecological preferences are different from those of *C. guanchica*, for example, the occurrence of *C. tirajanae* in shaded areas, (as discussed in the section of habitat and ecology). In addition, it produces a small quantity of sporangia (one or two for each fragment of pseudoindusium).

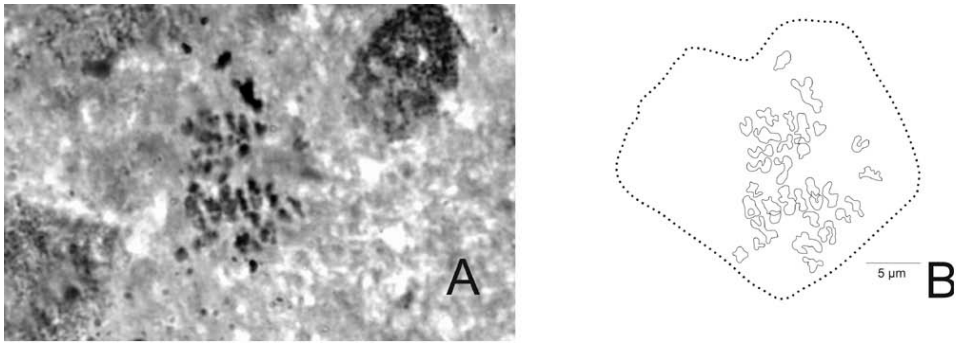

Figure **4.-** Diploid **C**hromosome of *Cheilanthes tirajanae* T. Sánchez Velázquez**.**

Because of these two facts, I conclude that *C. tirajanae* is scarce in Gran Canaria, although the possibility of its presence in the rest of the Canarian archipelago cannot be discarded. Nor do I reject the idea of *C. tirajanae* being hybridized, since I have observed forms resembling this species with abortive spores. Further investigation is necessary to confirm this fact.

A comparison of this new species with *C. maderensis* and *C. guanchica* is shown in Table 1.

Finally, we have developed a key to determine the Canarian species of the genus *Cheilanthes* in which we have included *C. hispanica* due to its taxonomic affinities

1. Pinnules with pseudoindusium. Abaxial side of lamina without scales…..... 2
- Pinnules without pseudoindusium. Abaxial side of lamina densely covered with imbricate scales…….. ***C. marantae*** subsp. ***subcordata***
2. Continuous or subcontinuous pseudoindusium. Pinnae apex elongated and oblong…..…….…….…… 3
- Discontinuous pseudoindusium, formed by small subquadrangular units. Pinnae apex neither elongated nor oblong ……..…. ……..…….. 4
3. Continuous pseudoindusium between 0.6 and 1 mm wide, almost covering the abaxial side of pinnules. Pinnules lanceolate-linear, somewhat lobed at base…….....…… ***C. pulchella***
- Subcontinuous pseudoindusium between 0.6 and 0.8 mm wide. Pinnules linear, sometimes ovate-linear……..... ***C. guanchica***
4. Lamina almost glabrous. Pinnules ovate-oblong, irregularly crenated…….…… ***C. maderensis***
- Lamina with glandular multicellular hairs on the abaxial surface .....…….....…….…… 5
5 Glandular multicellular hairs of lamina, between 0.06 and 0.3 (0.6) mm in length, spaced, formed by 2 - 7 cells (12) ….....…… ***C. tirajanae***
- Numerous glandular multicellular hairs on lamina……...6

Morphological characteristics	*guanchica*	*tirajanae*	*maderensis*
RHIZOME SCALES			
length (mm)	(0.5) 1.7 - 4.3 (5.7)	(1.2) 1.7 - 3.3 (4)	(0.5) 1.4 - 3.5 (4.7)
shape	oblong-linear	oblong-linear to lanceolate-linear	oblong-linear to linear
STIPE			
length	as long as or slightly longer than the lamina	two and three times longer than the lamina	slightly shorter than the lamina
scales in the upper half:	scarce	scarce	moderate
length (mm)	0.7 - 1.8 (4.4)	(0.7) 0.8 - 1.4 (1.7)	(0.7) 1.1 - 2.5 (3.5)
shape	narrow lanceolate-linear	narrow oblong-linear or lanceolate-linear	linear
glandular hairs in the upper half: length (mm)	0.1 - 0.6 (0.9)	(0.1) 0.26 - 0.8 (1)	glandular hairs absent
RACHIS			
scales	scarce	scarce	moderate
section transversed by its adaxial surface	with a deep groove flanked by two wings	with a very shallow groove not present in the stipes	with a deep groove flanked by two wings; sometimes with an inconspicuos second groove
FRONDS			
length (cm)	up to 18	up to 9	up to 16
LAMINA			
shape	ovate-triangular	triangular-deltoid	oblong-lanceolate
glandular hairs on the abaxial surface (rachis and pinnules):	only present on the rachis	scattered	almost glabrous
length (mm)	0.05 - 0.23 (0.5)	0.06 - 0.32 (0.65)	0.07 - 0.17 (0.35)
nº cells	2 - 6 (10)	2 - 7 (12)	2 - 4 (7)
PINNAE			
length (cm)	up to 3	up to 1.2	up to 2
shape of upper pinnae	lanceolate-linear	oblong	ovate-oblong
PINNULES			
shape	linear, sometimes oval-linear	oval	oval-oblong
margin	slightly lobed	lobed, sometimes irregularly crenated	lobed and irregularly crenated
PSEUDOINDUSIUM			
fragmentation	subcontinuous	discontinuous	discontinuous
width (mm)	broad (0.4) 0.6 - 0.8 (0.9)	narrow (0.3) 0.4 - 0.6 (0.7)	narrow (0.2) 0.3 – 0.5 (0.6)
margin	somewhat denticulate, margin with abundant papillae	somewhat denticulate, margin with occasional papillae	entire (undulate)
STOMATA ***(Guard cells)***			
length (µm)	(35) 39 - 49 (55)	(35) 37 - 46 (52.5)	(27.5) 35 - 43 (45)
SPORES			
length (µm)	(37.5) 46 - 56 (65)	(42.5) 46 - 53 (57.5)	(35) 38 - 47 (55)
perispore	reticulate-cristate, cristae rounded, abundant rodlets in all surface	cristate, irregular cristae and few rodlets	reticulate-cristate, cristae rounded , rodlets mostly on the margin of cristae
NUMBER OF CHROMOSOMES (2n)	60 pairs, tetraploid	30 pairs, diploid	30 pairs, diploid

Table 1.- Comparison of *Cheilanthes tirajanae* between *C. maderensis* and *C. Guanchica*

6 Glandular hairs not covering lamina, between 0.03 and 0.4 (1) mm in length. Comprised of 2 or 3 cells, although up to 13 cells can be observed in the longest hairs of the rachis. Stipes are less than twice the length of the lamina…….. ***C. tinaei***

- Glandular hairs covering lamina (0.1) 0.2–0.7 (0.9) mm in length, formed by 8–14 cells. Stipes more than twice the length of the lamina…….. ***C. hispanica***

ACKNOWLEDGEMENTS

I thank Dra. Carmen Prada at the Universidad Complutense de Madrid for her constructive criticisms of the manuscript. I would also like to express my gratitude to Águedo Marrero of the Jardín Botánico Canario "Viera y Clavijo" for his critical revision. I wish also to thank my colleague, Dr. Juan A. Alejandre Saénz for his collaboration in sending me material related to *C. hispanica* from the Iberian Peninsula. Similarly, my appreciation to Dra. Trinidad Arcos, at the Sección Departamental de Filología Clásica y Árabe del Departamento de Filología Española, Clásica y Árabe de la Universidad de las Palmas de Gran Canaria, for her preparation of the diagnosis in Latin.

REFERENCES

DEL ARCO, M. & O. RODRÍGUEZ DELGADO, 2003.- Las comunidades vegetales de Gran Canaria. En O. Rodríguez Delgado (Eds.), *Apuntes sobre Flora y Vegetación de Gran Canaria*: 71-134. Consejería de Medio Ambiente y Aguas, Cabildo de Gran Canaria.

HANSEN, A. & P. SUNDING, 1993.- Flora of Macaronesia. Checklist of vascular plants. 4 ed. Revised. *Sommerfeltia* 17: 9-21.

IUCN. Species Survival Commission, 2001.- *IUCN Red List Categories*. Gland: IUCN.

PICHI-SERMOLLI, R.E.G., 1985.- The genus *Cosentinia* Tod. *Webbia,* 39: 178-179.

RODRÍGUEZ DELGADO, O, M.J. DEL ARCO AGUILAR, A. GARCÍA GALLO, J.R. ACEBES GINOVÉS, P.L. PÉREZ DE PAZ & W. WILPRET, 1998.- *Catálogo sintaxonómico de las comunidades vegetales de plantas vasculares de la Subregión Canaria: Islas Canarias e Islas Salvajes*. Materiales Didácticos Universitarios. Ser. Biología 1. Servicio de Publicaciones. Universidad de La Laguna, 130 pp.

VIDA, G., C.N. PAGE, T.G. WALKER & T. REICHSTEIN, 1970.- Zytologie der Farn-Gattung *Cheilanthes* in Europa und auf den Kanarischen Inseln. *Verh. Schweiz. Naturforsch. Ges.*, 150: 149-150.

VIDA, G., C.N. PAGE, T.G. WALKER & T. REICHSTEIN, 1971.- Cytologie der Farn-Gattung *Cheilanthes* in Europa und auf den Canarischen Inseln. *Bauhinia,* 4(2): 223-253.