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This article has been modified to include a previously omitted table (Table 5).

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Basketry as an ecosystem service of wetlands: traditional crafts in central Spain

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Abstract. Ecosystem services from wetlands include products such as food, water, fibers, timber, medicinal plants, and genetic resources for agriculture. One of the most abundant supplies is the raw material for basketry. In this study we aim to document the role of wetland plants as resources for basketry and broom-making in the Guadiana river basin and to analyze the local traditional knowledge of the species used in the area. We describe different types of baskets and other artifacts, and document basketry techniques. We found 30 species belonging to 12 families, 18 of them occurring in wetlands, four in irrigated fields, and seven in the adjacent dry territories. Twenty species are used in the manufacture of brooms. Twenty two types of basketry artifacts are described with their uses. The area shows a relevant cultural heritage, not merely as it was in the past, but also adapted to the new cultural and social contexts. The degradation and loss of wetlands in central Spain threatens these ecosystems and their associated cultural heritage. We suggest the declaration of this intangible human heritage as the "Culture of the Mediterranean Wetlands" before it disappears.

Keywords. Basketry, broom, traditional knowledge, wetlands, national parks.

Resumen. Los servicios ecosistémicos de los humedales incluyen alimentos, agua, fibras, madera, plantas medicinales y recursos genéticos para la agricultura. Uno de los insumos más abundantes es la materia prima para la cestería. Documentamos el papel de las plantas de humedales como recurso para la cestería y la fabricación de escobas en la cuenca del río Guadiana y analizamos el conocimiento tradicional local de las diferentes especies. Describimos diferentes tipos de cestas y otros artefactos y documentamos técnicas de cestería. Encontramos 30 especies pertenecientes a 12 familias, 18 de ellas creciendo en humedales, 4 de campos de regadío y 7 de las áreas secas adyacentes. Para la fabricación de escobas se utilizan 20 especies. Se describen 22 tipos de artefactos de cestería con sus usos. El área muestra un patrimonio cultural relevante, no solo en el pasado, sino también adaptado a los nuevos contextos culturales y sociales. La degradación y pérdida de humedales en España central amenaza estos ecosistemas y su patrimonio cultural asociado. Sugerimos la declaración de este patrimonio humano intangible como "Cultura de los Humedales del Mediterráneo" antes de que desaparezca.

Palabras clave. Cestería, escoba, conocimientos tradicionales, humedales, parques nacionales.

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INTRODUCTION

Wetlands are ecosystems characterized by their distinctive hydrology, soils, fauna and vegetation. These characteristics make them highly distinct from their surroundings and highly specialized cultural traditions have evolved based on the sustainable exploitation of the different wetland resources (EPA 2021a). Inland wetlands, include freshwater marshes and wet meadows but also wet prairies and fens. Freshwater marshes are characterized by periodic or permanent shallow water, little or no peat deposition, and mineral soils. Wet meadows commonly occur in poorly drained areas such as shallow lake basins where precipitation serves as their primary water supply, and they are often dry in the summer. Wet prairies are similar to wet meadows but remain saturated longer. Wet prairies may receive water from intermittent streams as well as groundwater and precipitation. Fens are groundwater-fed peat forming wetlands covered by grasses, sedges and reeds (EPA 2021b).

Wetlands are some of the most biologically productive natural ecosystems in the world, comparable to tropical rain forests and coral reefs in their productivity and the diversity of species they support. Abundant vegetation and shallow water provide diverse habitats for fish and wildlife (EPA 2021c). Wetlands are now recognized as important features in the landscape that provide numerous beneficial services for people. Some of these services, or functions, include protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters, and maintaining surface water flow during dry periods. These beneficial services, considered valuable to societies worldwide, are the result of the inherent and unique natural characteristics of wetlands. Other ecosystem services from wetlands include food, timber, fibers, and genetic resources for medicine, food and agriculture (EPA 2021b; Mitsch & al. 2015; Rivera & al. 2019). One of the most notable services is the abundant supply of raw material for basketry and brooms provided by wetland plants, especially helophytes (Balfet 2019). In Spain and other countries with dry climates, people living in wetlands also exploit the crops from irrigated lands and dry areas (crops, meadows, bushes and forests).

Besides the ecological relevance of wetlands, their global extent is estimated to have declined between 64–71% in the 20th century and because of wetland losses and degradation, people are deprived of the ecosystem services that wetlands provide (Gardner & al. 2015). In the Iberian Peninsula the estimated losses of 60–70% occurred between 1940s and 2000 (Morillo & Gómez-Campo 2000).

Wetlands are especially rich in plants used for basketry. Around the world, the diversity of plants used in basketry shows the adaptability of traditional knowledge to the environment but techniques are, more or less, quite similar (Adovasio 2010; Nedelcheva & al. 2011). Basketry techniques allow the transformation of the raw material into a particular piece. The skill of each craftsman (or woman) is appreciated in his work, in the selection of material and especially in the details. The excellence of the work is also appreciated in the beginnings and endings, the details. By empirically testing the different materials, human communities have discovered the technical characteristics of each fibre (hardness, durability, ease of work), optimal harvest period, handling and curing, and its possibilities (Peri & Patterson 1976).

Basketry is well documented in the Iberian Peninsula since the Neolithic (Cacho & al. 1996). During the last quarter of the 20th century, Kuoni (2003) exhaustively recorded traditional basketry techniques in Spain. Despite their cultural relevance, basketry and broom-making associated to the wetlands area of the interior of Spain has so far been scarcely or marginally documented. Verde & al. (2000) concisely mention several wetland plants used in basketry and broom-making in the Parque Nacional de Cabañeros area. These and other species are incidentally mentioned in the Daimiel area by Escuderos (1996), Consuegra (2009) and Cirujano & Álvarez-Cobelas (2015).

The profound environmental transformations that occur in all inland wetlands, in a context of climate change, transformation of land use and management of water resources, and acculturation led to the loss of knowledge associated with these wetlands. Thus the present study, covering two different types of wetlands in Guadiana river (those of Cabañeros and those of Daimiel), adds to the efforts to preserve wetlands and the traditional culture associated with them. Our aims were to: 1) document the plants used for basket weaving and broom-making and in the area differentiating the plants gathered in wetlands from species obtained in other ecosystems, but used in the same cultural context; 2) to analyze the traditional knowledge about the different plant species used: management, collection, storage and uses; 3) to document local basketry techniques and to analyze and describe the most important basketry objects for traditional work and daily life of the inhabitants of wetlands.

MATERIALS AND METHODS

Study area

Our fieldwork was conducted in the province of Ciudad Real (Castilla-La Mancha, Spain), in the upper Guadiana river area, and, specifically, within two national parks (Tablas de Daimiel and Cabañeros) territories, along with the lands between these two protected areas (Fig. 1). However, given the scarce human population in the interior of the national parks, the peripheral areas of the same municipalities to which the protected areas of the parks belong, are

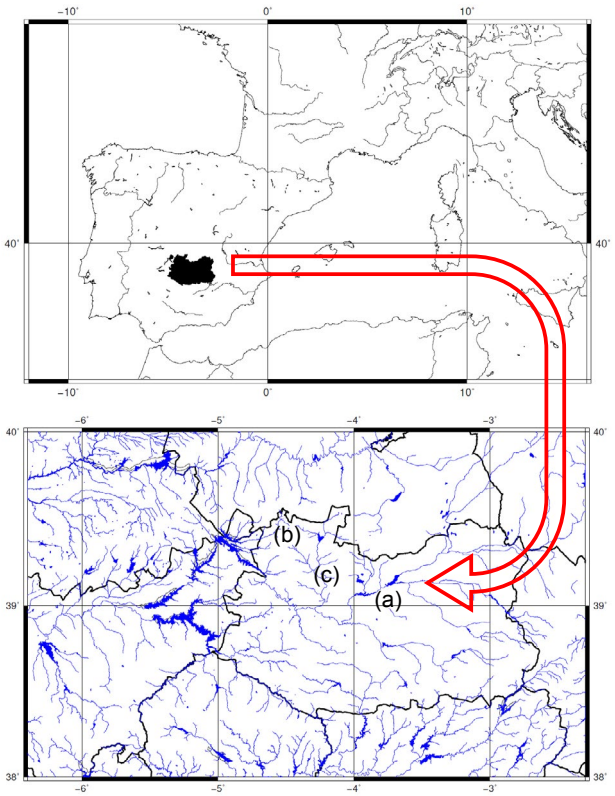

Fig. 1. Localization of the research area in Spain: **a,** Tablas de Daimiel; **b,** Cabañeros; **c,** Intermediate zone.

very important since their inhabitants have resorted to wetlands as a source of resources. In addition, the intermediate area (Fig. 1), which extends through the municipalities of Malagón, Fuente del Fresno, Fernán Caballero, Luciana and Porzuna, has been one of the areas where we have been able to record more and better information on basket weaving with resources from wetlands.

The Guadiana river is among the four major rivers of the Iberian Peninsula that flow into the Atlantic Ocean. The upper Guadiana river crosses La Mancha plains of Ciudad Real (Mejías 2013). Above the town of Daimiel, the Azuer and Cigüela rivers converge with the water upwelling of "Ojos del Guadiana" forming a wide wetland area called "Tablas"–a unique landscape and environment, declared national park in 1973. There, a highly specialized culture was developed based on the sustainable exploitation of the resources provided by this wetland. People of this culture were known as "people of the river" (Del Moral 2013).

Farther west, the Guadiana river receives waters of its tributaries: the Bullaque and Estena rivers. They collect waters of a large natural area known as "Montes de Toledo", covered by a relatively well-preserved Mediterranean forest. Within this area is the National Park of Cabañeros. Numerous streams flow their waters into the plains (locally named *rañas*) occasionally forming temporary wetlands. In this area occur the siliceous mountain slopes called *trampales*. They are associated with water upwelling, and are elliptical or half-moon shaped, typically covered with peat-bog vegetation (De la Cruz & al. 1995). Over the almost flat region of La Mancha, north and south of the Guadiana river, exist numerous intermittently inundated wetlands, temporary wetlands, known under the Spanish names of *hoya, lagunajo, lavajo,* and even *laguna* (Cirujano & Medina 2002). Temporary wetlands enhance biodiversity and provide aesthetic, biogeochemical and hydrological functions (Calhoun & al. 2017), and resources suitable for basketry (Cirujano & Medina 2002).

From the Copper Age (Chalcolithic), third millennium BC, the inhabitants of La Mancha plain already lived organized in groups controlling, among other strategic resources, water. During the Bronze Age (2,400–2,300 BC) an architectonic and cultural complex known as *Cultura de la Motillas* (little hills) developed closely associated with wetlands and lagoons (Llorach & al. 2000). The *Motillas* are fortified dwellings on low mounds with a circular design and double or triple walls, sometimes with a central tower. Usually, they are placed in the center of lagoons, endorheic zones, wetlands or bogs (Benítez de Lugo 2010; Benítez de Lugo & Mejías 2013).

Freshwater fishing has provided a way of subsistence for centuries for numerous people in the Guadiana river area. In 1575, the "Relaciones de Felipe II", a public inventory of villages and resources in the Kingdom of Castile, in the description of Carrión de Calatrava, mentions uses of nets and fishing traps, made with rushes (*garlitos de juncos*) as a way to catch the rich fisheries of the river with eels and other species (ANTC 2016). Madoz (1845) quoted the richness of Daimiel in fish, especially barbells (*Barbus* sp. pl.) and common eels [*Anguilla anguilla* (Linnaeus 1758)].

Exploitation of the Guadiana river resources was spatially organized allotting the rights to families over a more or less long stretch of river. Each family inhabited a specific construction, a fishermen hut (*casillas de pescadores*), provided with a contiguous small subsistence garden. However, for these families, the main resources came from the immediate wetlands, not only from fisheries but also secondarily, from the use of the plants, especially for basketry. In the 1960s around 200 families lived in the stretch of the river between Villarrubia de los Ojos and old Alarcos bridge (Valverde county), devoted exclusively to fishing crabs to be sold in the Madrid central market (ANTC 2016). Unlike other places and communities such as the Pima-Papago of Arizona (Potter & Focht 2010) the work of basketry is a predominantly male activity.

These wetlands are rich in helophytes, plants of swampy zones, mainly belonging to Cyperaceae, Juncaceae and Po-

aceae families (Arauzo & al. 2004; Cirujano & Medina 2002). These species form dense populations, vegetatively propagated by rhizomes and are associated with flooding regimes. However, most of such species produce fertile seeds. The helophytes have been an essential resource for the people of the Guadiana river for the following uses.

Building material.—The fishermen's homes (*casillas)* were thatched with a layer of reed or *carrizo* [*Phragmites australis* (Cav.) Trin. ex Steud.] or other plants as rushes or *juncos* [*Scirpoides holoschoenus* (L.) Soják] (Verde & Fajardo 2003b). A layer of overlapping reeds over which the rainwater drained while keeping the house dry, even in the main village of Daimiel, in the 19th century about 200 houses belonging to poorest people were covered with reed thatches (Madoz 1845) (Fig. 2a).

Medicinal resources.—Reported in several works (Consuegra 2009; Molero-Mesa & al. 2001; Rivera & al. 2019; Verde & Fajardo 2003a; Verde 2002; Verde & al. 2000, 2008).

Food resources.—Basal parts of stems and leaves of rushes were traditionally consumed as food (Rivera & al. 2007).

Other purposes.—For chair seats or basketry, mattress filling or fueling ovens, or fishing tools (Fig. 2b).

The desiccation of La Mancha wetlands, including "Las Tablas", led in the 1980s to the extinction of this way of life, which in it was a model for sustainable development and adaptation to local resources. Furthermore, because land and water reclamation for agriculture, notably the transformation into irrigation of thousands of hectares within the largest area of vineyards in the world and the decline of water quality, most of the riverine fish species vanished or became rare and endangered. National and regional laws were enacted to protect such areas forbidding the commercial fishing activity and forcing the fishermen to abandon their traditional lifestyle. The fishermen's activity collapsed progressively between 1960s and 1980s (Escuderos 1996). Some of the fishing arts, tools, among others, used by fishermen and their families, were made with wetland plants using different basketry techniques.

In the cultural context of basketry in these wetlands, cultivated plants such as maize or corn (*Zea mays* L.) or broom corn or *escobas de año* [*Sorghum bicolor* (L.) Moench] and other plants from adjacent ecosystems are used, especially esparto grass (*Stipa tenacissima* L.), with a long tradition throughout the area. Even, species such as giant reed or *caña* (*Arundo donax* L.), seemingly introduced or domesticated in the Mediterranean basin since millennia and integrated in wetlands, can provide ecosystemic services (Verde & al. 2000; Hardion & al. 2014; Fajardo & al. 2015).

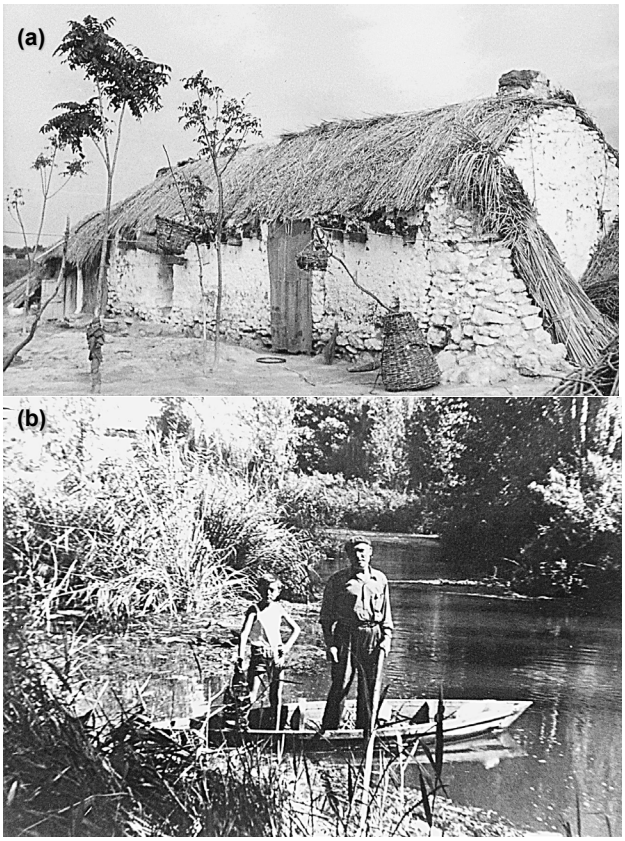

Fig. 2. Tablas de Daimiel: **a,** Fishermen hut, careless thatching with *Phragmites australis*, El Morenillo, 1960´s; **b,** fishing with traps (garlitos) [source: Banco de Imagen, Centro del Agua, Daimiel].

The National Park of Tablas de Daimiel, is characterized by the wetlands associated with the Guadiana river. Tablas de Daimiel has a total area of roughly 3,030 ha, which is dependent on two types of water inputs: the superficial ones, from the Azuer and especially the Cigüela river–very irregular and linked to climatological factors; and the phreatic groundwater, from the Guadiana river. Eventually, a transfer of water from the Tajo–Segura aqueduct feeds Tablas de Daimiel through the recharge of the aquifer 23 (Mejías 2013). Tablas de Daimiel extends between: latitude 39°06'39"–39°11'19"N and longitude 3°38'53"–3°46'25"W. Tablas de Daimiel is a Ramsar site, which was declared a protected area in 1966 through the creation of a National Hunting Reserve and, finally, in 1973 it was declared as national park (Carrasco 2013; MITECO 2018a). The almost exclusive arboreal vegetation is formed by tamarisks or *tarayes*, notably *Tamarix canariensis* Willd.

The Cabañeros National Park extends along the southern foothills of Montes de Toledo in the northwestern part of Ciudad Real over an area of about 40,856 ha, at latitude 39°16'52"–39°34'49"N, and longitude 4°15'00"–4°40'43"W. It was declared as national park in 1995

(MITECO 2018b). Cabañeros is located ca. 7 km north of the Guadiana river and includes the course of some of its tributaries as "El Bullaque". Its vegetation includes typical Mediterranean forests and shrublands and relatively well preserved open semi-natural oak forests (*dehesas*). Despite the dominance of terrestrial vegetation, Cabañeros also encloses small wetland areas (*trampales*) and riverine zones, where the culture of fishermen and craftsmen was also maintained for centuries at a lower scale.

MATERIAL AND METHODS

Fieldwork was carried out from 1998 to 2018. The area of study was periodically visited. For this particular purpose, we selected as informants the last fishermen of the Guadiana river, local craftsmen and shepherds with deep knowledge on basket weaving and broom making. Overall, we conducted 123 semi-structured interviews with 144 informants (single or in groups, 125 male and 19 female), generally born in the area and recognized by the community as having sound traditional knowledge (Table 1). We proceeded through prior informed consent according to the protocols of the International Society of Ethnobiology (2006).

Semi-structured interviews consisted of questions on crafts techniques and crude materials. Among others, the interviewers asked what species were used, when and how they were collected, how they were prepared and preserved, what techniques were used and what objects were made with them. These aspects were documented graphically and by means of the elaboration of herbarium specimens that were deposited in the herbarium of Instituto Botánico de la Universidad de Castilla-La Mancha (ALBA). The interviews were largely conducted in the field, in order to identify the plants and collect voucher specimens. The species names and botanical families were standardized according to The Plant List (2018).

Drought and overexploitation of aquifers in the last thirty years led to the disappearance of numerous wetlands in the study area, this made our informants unable to show us several plant species they used in the past which presumably became extinct in the region. In order to get those plants identified by the informants, we showed them samples from likely species grown at the Botanical Garden of Castilla-La Mancha (Albacete).

Collections of basketry and artifacts in the Ethnographical Museums and interpretation centers of national parks provided us with an overview of pieces traditionally used in the area and their typologies together with those displayed by our informants. Among these particularly helpful were the museums from Alcoba (MUSALC 2019), Casa Palillos, Horcajo de los Montes (MUSHOR 2019), Villarrubia de los Ojos (MUSVIL 2019), Molino de Molemocho, and Museo Etnográfico del Campo de Calatrava (Almagro) (MUSECC 2019). Other pieces are in the Museo de Ciudad Real (MUSCR 2019) and Museo Comarcal de Daimiel. Definitions of types of pieces are based on the Diccionario de la Real Academia Española (DRAE 2018).

The results of this work were incorporated into a database. In this database, 927 records are related to crafts in general; among those 584 refer to uses of plants in basketry. Each individual record corresponds to a singular set: informant (or set of informants), plant species, part used, object created and associated procedures, date and place.

Table 1. Number of informants and interviews in the upper Guadiana river, including intermediate areas*.

Study area	Male	Ages	Female	Ages	Average age	Interviews
Cabañeros	45	39–93	11	57–88	82	66
Daimiel	18	50–89	3	74	68	33
Other*	62	57–89	5	61–82	75	24
Total	125		19		76	123

RESULTS AND DISCUSSION

The species and their availability

Thirty vascular plant species were recorded as used for basketry in the upper Guadiana river area, belonging to twelve different botanical families (Table 2, Fig. 3). Among these, most species (twenty-three) occurred in wetlands and irrigated fields totalizing twelve different types of habitats of periodically or continually flooded areas (Tables 2, 3). However, seven species traditionally used by people of the wetland area occurred in six different types of habitats characterized by low soil humidity (Tables 2, 3). In number of species the most relevant habitats are: seasonally flooded meadows on subsaline soils of the Western Mediterranean and Reed swamp vegetation of mesotrophic and eutrophic standing freshwater bodies or gently moving streams of boreo-temperate Eurasia.

Here, in the upper Guadiana river, we found that people use a range of species, which takes advantage of the available resources optimizing their uses according to the purposes, but, also, recurred to imported materials such as esparto grass and wicker when these were locally unavailable and required by the specific technique of manufacture.

Basketry plants were classified by Merrill (1922) for California, according to their availability and geographical distribution, into three categories: distribution much-exceeding use, distribution little exceeding use and imported materials. Merrill (1922) concluded that most basket mate-

Table 2. Species used for basketry in the upper Guadiana river area. Dry areas include natural and cultivated ones.

Taxa / Habitat	Local names	Parts used	Basketry	Other crafts
Wetlands and watered fields				
Cyperaceae				
Bolboschoenus maritimus (L.) Palla (= *Scirpus maritimus* L.)	Castañuela, pastillo	Stem, leaf	–	Ropes, Mattress filling
Carex divisa Huds.	Maseguilla	Stem, leaf	–	Mattress filling
Carex riparia Curtis	Espadilla	Leaf	–	Chair seats
Cyperus longus L.	Juncia	Stem	–	Ropes, strings
Schoenoplectus lacustris (L.) Palla (=*Scirpus lacustris* L.)	Bon, bayunco	Stem, leaf	–	Chair seats
Schoenus nigricans L.	Almorchín	Stem	Fishing traps	Mattress filling
Scirpoides holoschoenus (L.) Soják	Junco, junco vano	Stem	Fishing traps	Hut roofing, Curtains
Juncaceae				
Juncus acutus L.	Junco merino, junco garlitero	Stem, leaf	Fishing traps	–
Juncus inflexus L.	Junco fino	Stem, leaf	Fishing traps	To wrap the bait
Malvaceae				
Althaea officinalis L.	Malvavisco, malvarisco	Stem	–	Curtains, Ropes
Gossypium herbaceum L.	Algodón	Fiber	–	Fishing nets
Oleaceae				
Olea europaea L.	Oliva	Young shoot, twig	Garlito rings	–
Poaceae				
Arundo donax L.	Caña	Stem	Baskets	Buildings
Imperata cylindrica (L.) Raeusch.	Palma	Leaf	–	Hats
Phragmites australis (Cav.) Trin. ex Steud.	Carrizo	Stem, leaf	Baskets	Hut roofing
Zea mays L.	Maíz	Cob leaf	–	Rugs, mattress filling
Salicaceae				
Salix atrocinerea Brot.	Zauz, zao	Young shoot, twig	Baskets	–
Salix fragilis L.	Mimbrera	Young shoot, twig	Baskets, fishing traps	–
Sparganiaceae				
Sparganium erectum L.	Espadaña	Leaf	Baskets	–
Tamaricaceae				
Tamarix canariensis Willd.	Taray	Young shoot, twig	*Garlito* rings	–
Typhaceae				
Typha domingensis Pers.	Anea, enea, inea	Leaf	Baskets	Chair seats
Typha latifolia L.	Anea, enea, inea	Leaf	Baskets	Chair seats
Vitaceae				
Vitis vinifera L.	Sarmientos (shoots)	Year stems	*Garlito* rings	–
Dry habitats				
Asparagaceae				
Agave americana L.	Pita	Leaf	–	Ropes
Poaceae				
Lygeum spartum Loefl. ex L.	Albardín	Leaf	–	Ropes
Secale cereale L.	Centeno	Stem	Baskets	–
Stipa gigantea Link	Albaceo	Leaf	Baskets	–
Stipa tenacissima L.	Esparto	Leaf	Baskets	Ropes
Triticum aestivum L.	Trigo	Stem	Baskets	–
Thymelaeaceae				
Daphne gnidium L.	Torovisco	Bark	–	Ropes

Fig. 3. Species used for basketry: **a,** *Stipa tenacissima;* **b,** *Scirpus lacustris*; **c,** *Juncus acutus*; **d,** *Carex riparia*; **e,** *Cyperus longus*; **f,** *Typha domingensis* [photos: C. Obón, A. Verde and J. Fajardo].

rials have a wider range than their use and that geographic distribution is not the controlling factor in their selection. If the availability of certain plants cannot be regarded as the reason for their uses, Merrill (1922) hypothesized that the technique of manufacture is the governing factor. Weavers consider the properties of the plants in the weaving technique, in the preparation of the element, and in the subsequent use of the basket, thus they combine species from different provenances to optimize their baskets (Peri & Patterson 1976). As did Merrill (1922) for California we can conclude that there is a convergence of factors which determines the list of species in use, not only their local availability.

Many of the species used are helophytes plants of the marshes that grow to form large populations practically monospecific. In particular, tall helophytes such as cattail or *anea* (*Typha* spp.), club-rush or *bon* [*Schoenoplectus lacustris* (L.) Palla], bulrush or *castañuela* [*Bolboschoenus maritimus* (L.) Palla] and reeds are very common in local basketwork. However, not all helophytes are used in basketry. The swamp sawgrass, locally named *masiega* [*Cladium mariscus* (L.) Poll. (Cyperaceae), with its sharp blades, is no used in basketry, but, it was, instead, used as a fuel for gypsum ovens and heating lime kilns (Escuderos 1996). It possess very tough leaves whose keel and margins, especially in the distal part, bear short hard spines that give sharply cutting edges (Conway 1942) that make them difficult to handle for basketry. Its roots were reported as basketry materials coiled by Native tribes of California (Merriam 1903) but we did not record this use in the Guadiana area. The use of its aerial parts for thatching is recorded by Simpson & Inglis (2001) but in the Guadiana area reeds are preferred for this purpose.

The thirty vascular plant species recorded belong to twelve different botanical families. Among the best-represented botanical families are Poaceae, with nine species, and Cyperaceae, with seven species, together representing a 53.3% of all the recorded species (Table 2). Stems and leaves are the plant parts more frequently employed for basketry in the upper Guadiana river.

Different sedge and bulrush species belonging to the genera *Carex, Bolboschoenus, Schoenoplectus, Schoenus, Scirpoides,* and *Cyperus* were locally used with different relevance within the local culture (Table 2). The greater pond-sedge or *espadilla* (*Carex riparia* Curtis), after being cut, dried, whitened and softened, was used to make the seats of the chairs as a substitute of cattail leaves (Escudero 1996). Cyperaceae are largely used in crafts, but also as animal food (Simpson & Inglis 2001).

Several smaller sedge helophytes, locally known as *maseguilla* (*Carex divisa* Huds. and other species), were used to fill mattresses on which fishermen and their families slept. Traditionally, a seam was made by braiding sedge stems; nowadays already elaborated ropes like sisal or plastic strings tend to be used. It is worth noticing that in other areas the rootstock is the part of sedges which is used in basketry (Peri & Patterson 1976).

Cattail species present in the area are *Typha domingensis* Pers., in Las Tablas de Daimiel zone, and *T. latifolia* L., in the areas with continuous flooding and better water quality than the above mentioned species (Cirujano & Medina 2002; Cirujano & Morales 1995). Being widely available, cattail is the most important plant in basketry of the area. This species usually has a clumped distribution under high flow conditions with clumps of shoots located 50–70 cm from each other, while under low or no flow the distribution is random (Asaeda & al. 2005). Craftsmen interviewed in Daimiel distinguish between *macho* (= male shoots) (plants provided with flowering stems topped with the characteristic inflorescence which consists of male and female flowers) and *pencas*, sterile shoots, without inflorescences, presumably the younger ones. Only the latter are used for basketwork. Here flowering shoots are discarded for use and only shoot exclusively consisting of a bunch of leaves are reserved. However, these flowering stems have a wide range of possibilities for thatching huts, making sandals or to form large screens (Morton 1975). Cattail clumps are cut at the end of summer when leaves are stronger. Near the place of the harvest, cattail shoots are disposed of on the ground for one to a couple of weeks so that the sun whitens the leaves. Then when well dried and bleached these are collected before the arrival of the autumn storms and stored in a shaded place. Immediately before being worked, cattail should be moistened to reach the appropriate degree of humidity. Sometimes, to keep humid, the material that is going to be worked is covered with a wet blanket. With these wet leaves, the artisan makes a braid, which depending on the work to be destined, consists of 3, 5, 7, 9 strands. In every one, a new leaf is added when the previous one is finished, always leaving the tips on the back face of the braid. Once a sufficient length of the braid has been obtained, it is sewn.

Several species of Poaceae were widely collected in the upper Guadiana river area, notably reed and giant reed. Reed was cut and used for thatching huts. This use was already mentioned for Tablas de Daimiel area (Escuderos 1996). Although not explicitly recorded from our informants the giant reed basketry was practised by nomad Romani or Roma people in central Spain, including La Mancha areas (Kuoni 2003; Rivera & Obón 1991). The use of giant reed in traditional basketry produced by Roma is recorded in other countries of Europe and west Asia (Dogan & al. 2008). Reed and giant reed were used to build sheds as well as for plaster ceilings in Doñana (Andalusia/Spain) (Cobo & Tijera 2008). The giant reed-related knowledge

(management and uses) is widely declining in the Mediterranean in the 21st century (Gücel 2010). Notwithstanding this loss of utility, some studies show giant reed as a promising species for bioconstruction given its thermal isolating properties (Barreca 2010; Barreca 2012). Presently, giant reed is included within the Spanish catalogue of exotic invasive species and several attempts were made to eradicate this species (MITECO 2013).

Willows (*Salix atrocinerea* Brot.*, S. fragilis* L., and *S. neotricha* Goerz) were planted in the areas close to running waters. There were wicker plantations in the "Finca Juárez" located about 6 km away from Daimiel. Wicker production reached here quantities that allowed its export to other places in Spain. Repeated fires destroyed that plantation around 1940 (Martín & al. 2004). When there was no wicker from local willows it was brought from Cuenca, an important production and manufacturing wicker area (Kuoni 2003). There were numerous women in the upper Guadiana area who stood out for the quality of the baskets they manufactured. In many cases, these jobs were the tasks of entire families without distinction of gender (Clemente 2013; Martín & al. 2004). In the marshes of Doñana (Andalusia/Spain) similar uses to those of the Tablas de Daimiel were recorded. In Doñana the most often used species are cattail, bulrush, club-rush, sharp rush or *junco merino* (*Juncus acutus* L.), reed and giant reed (Cobo & Tijera 2008).

Not all plants used in basketry in the area came from wetlands. Fields, grasslands and *dehesas* (open oak forest formations) present other relevant crude materials (Table 3): rye stems or *centeno* (*Secale cereale* L.), esparto grass leaves and others. In the Daimiel area, esparto grass is used but it does not grow in the territory, while other large-leaved *Stipa* species grow such as giant feather grass or *albaceo* (*Stipa gigantea* Link) but the latter furnish unsuitable low-quality leaves. Esparto grass leaves were thus not collected in the area, instead, these were brought from localities situated, at least, one-hundred kilometres away (Fig. 3a) this is consistent with the theory of Merrill (1922) on the factors governing the selection of species and the optimization of technical aspects mentioned by Peri & Patterson (1976). In Spain, esparto grass has the highest level of versatility but also of specificity within basketry techniques (Barber & al. 1997; Fajardo & al. 2015). Stems of rye have also been widely used in Spain in basket weaving (Kuoni 2003; González & Amich 2015).

The olive tree (*Olea europaea* L.) has been used to make fishing tramps called *garlitos*. The suckers (*varetas de olivo*) are used as rods in basketry (Gutiérrez-Murillo & al. 2018). Also other Mediterranean plant, grape vine (*Vitis vinifera* L.) was used for *garlitos*.

Today, some of the few basket makers that still work in the area use plastic cords to do their jobs, in parallel with the use of traditional materials. The difficulty of collecting traditional species is due not only to the degradation of their habitats but also to the rules governing the management of natural areas under protection. This makes it easier and, often, cheaper to recur to synthetic materials. This shows that people use with preference available resources and move from plants to new materials, using traditional or renewed techniques for the same or new purposes, therefore adapting to new circumstances.

Main habitats and their fragility

The most relevant habitats are those with higher water availability were twenty-three species came from. These species grow (Table 3) in temporarily flooded freshwater habitats, seasonally flooded meadows on subsaline soils (Fig. 4d), mesotrophic and eutrophic standing freshwater bodies (Fig. 4b), gently moving streams, small freshwater streams and shallow water bodies, or oligotrophic to mesotrophic organic sediments (Fig. 4f). Other habitats for these species are more directly linked to the Guadiana river course and its tributaries: riparian forests, tall-herb vegetation in nutrient-rich riparian, tamarisk riparian scrub and megarad beds of subsaline sandy intermittent rivers (Table 3).

The seven species from more or less dry areas came from thermo- to meso- and supra-Mediterranean semi-arid oak and low pine matorral, edaphic steppes on loamy or clayey soils and xeric-subhumid acidophilus pastures on sandy-loamy soils. Others, such as rye, are produced in arable lands (Table 3). Overall these habitats are less prone to degradation although increasing climatic drought and present expansion rates of irrigated fields (pistachio, vineyards, olive and almond) may lead to severe losses.

Finally, watered gardens furnished by-products of the orchard which were used as raw materials in crafts, such as maize leaves. Small subsistence gardens located next to the fishermen homes provided other useful materials for crafts. Some, such as the broom corn or the giant reed, were cultivated almost exclusively for the production of stiff stems used to tread climbing vegetables (beans, tomatoes, etc.).

Local populations were highly dependent on the status of wetlands in terms of water table extension and water quality deterioration. This was seriously degraded as a result of systematic overexploitation of aquifers for extensive agricultural purposes since the 1970s (Berzas & al. 2000; Castaño 2008; Castaño & al. 2018). The coincidence of persistent climatic drought and overexploitation of phreatic waters led to the frequent desiccation of the sources of Guadiana river in Villarrubia de los Ojos (Fig. 4c) and parts of the Guadiana river itself (Fig. 4e). In terms of availability of resources this degradation was fatal: several species such as greater pond-sedge disappeared from the area and others such as swamp sawgrass became rarer and, overall,

Table 3. Types of habitats furnishing crude materials for basketry in the upper Guadiana river area (Spain). Dry habitats include natural and cultivated ones. Vegetation of Europe according to Mucina & al. (2016). Habitat number is based on European Commission (2013). *S9-4131 in the EUNIS classification 2017 – Revised forest heathland scrub tundra.

Main category	Vegetation of Europe	Habitat	EUNIS 2012	Species
Wetlands and watered fields				
Seasonally flooded meadows on subsaline soils of the Western Mediterranean	MOL-07A *Molinio-Holoschoenion* Br.-Bl. ex Tchou 1948	6420	E3.1 Mediterranean tall humid grassland	*Carex divisa* Huds., *Cyperus longus* L., *Juncus acutus* L., *Juncus inflexus* L., *Schoenus nigricans L., Scirpoides holoschoenus* (L.) Soják
Reed swamp vegetation of mesotrophic and eutrophic standing freshwater bodies or gently moving streams of boreo-temperate Eurasia	PHR-*01APhragmition communis* Koch 1926	7210	C3.2 Water-fringing reedbeds and tall helophytes other than canes	*Phragmites australis* (Cav.) Trin. ex Steud., *Schoenoplectus lacustris* (L.) Palla, *Typha domingensis* Pers., *Typha latifolia* L.
Herbland vegetation of small freshwater streams and in shallow water bodies of temperate Europe	PHR-05A *Glycerio-Sparganion* Br.-Bl. et Sissingh in Boer 1942	7210	C3.242 Neglected bur-reed communities	*Sparganium erectum* L.
Tall-rush subsaline reed communities of the continental regions of the Iberian Peninsula and the Pannonian Basin	PHR-02B *Meliloto dentati-Bolboschoenion maritimi* Hroudova et al. 2009	7210	C3.27. Halophile Scirpus beds	*Bolboschoenus maritimus* (L.) Palla
Sedge-bed marsh vegetation on oligotrophic to mesotrophic organic sediments of temperate Europe	PHR-04A *Magnocaricion elatae* Koch 1926	7210	D5.21 Beds of large [*Carex*] species	*Althaea officinalis* L. *Carex riparia* Curtis
Riparian forests of the submediterranean regions of Southern France and the Iberian Peninsula	POP-01A*Populion albae* Br.-Bl. ex Tchou 1949	92A0	G2.311 Iberian poplar galleries	*Salix atrocinerea* Brot., *Salix fragilis* L.
Western Mediterranean tall-herb vegetation in nutrient-rich riparian habitats	EPI-05D *Cynancho-Convolvulion sepium* Rivas Goday et Rivas-Mart. ex Rivas-Mart. 1977	92D0	E1.44 Cane steppes	*Arundo donax* L.
Infra-mesomediterranean megareed beds of subsaline sandy intermittent rivers and hind dune depressions of Mediterranean Europe and North Africa	PHR-03A *Imperato cylindricae-Saccharion ravennae* Br.- Bl. et O. de Bolos 1958	92D0	E1.44 Cane steppes	*Imperata cylindrica* (L.) Raeusch.
Infra- to supramediterranean tamarisk riparian scrub in temporarily flooded freshwater habitats of the Western Mediterranean	NER-01A *Tamaricion africanae* Br.-Bl. et O. de Bolos 1958	92D0	*F9.3131 West Mediterranean tamarisk thickets	*Tamarix canariensis* Willd.
Arable lands and market gardens	–	–	I2.22 Subsistence garden areas	*Gossypium herbaceum* L., *Zea mays* L.
Shrub plantations	–	–	FB.41 Traditional vineyards FB.42 Intensive vineyards	*Vitis vinifera* L.
Evergreen orchards and groves	–	–	G2.91Olive groves	*Olea europaea* L.
Dry habitats				
Eastern Iberian meso-supramediterranean semiarid oak and low pine matorral	QUI-04D *Rhamno lycioidis-Quercion cocciferae* RivasGoday ex Rivas-Mart. 1975	4210	F6.11 Western kermes oak garrigues	*Daphne gnidium* L.
Relict Southern Iberian thermomediterranean edaphic steppes on deep loamy-clayey soils	LYG-02B *Stipion tenacissimae* Rivas-Mart. 1984	6220	E1.41 *Stipa tenacissima* steppes	*Stipa tenacissima* L.
Relict Central Iberian edaphic steppes on deep clayey soils	LYG-02A *Agropyro pectinati-Lygeion sparti* Br.-Bl. et O.de Bolos 1958 corr. Rivas-Mart. et al. 1999	6220	E1.42 *Lygeum spartum* steppes	*Lygeum spartum* Loefl. ex L.
Lusitano-Carpetanian thermo- to supramediterranean xeric-subhumid acidophilous pastures on sandy-loamy soils	SAC-01C *Agrostio castellanae-Stipion giganteae* Rivas Goday ex Rivas-Mart. et Fernandez-Gonzalez 1991	6220	E1.432 - Mediterranean feathergrass steppes	*Stipa gigantea* Link

Table 3. Cont'd.

Main category	Vegetation of Europe	Habitat	EUNIS 2012	Species
Arable lands and market gardens	–	–	I1.1 Intensive unmixed crops, I1.3 Arable land with unmixed crops grown by low-intensity agricultural methods	*Secale cereale* L., *Triticum aestivum* L.
Cultivated areas, anthropic areas and zones invaded by allochthonous species	–	–	I3.3.ES Formations dominated by invasive *Agave species*	*Agave americana* L.

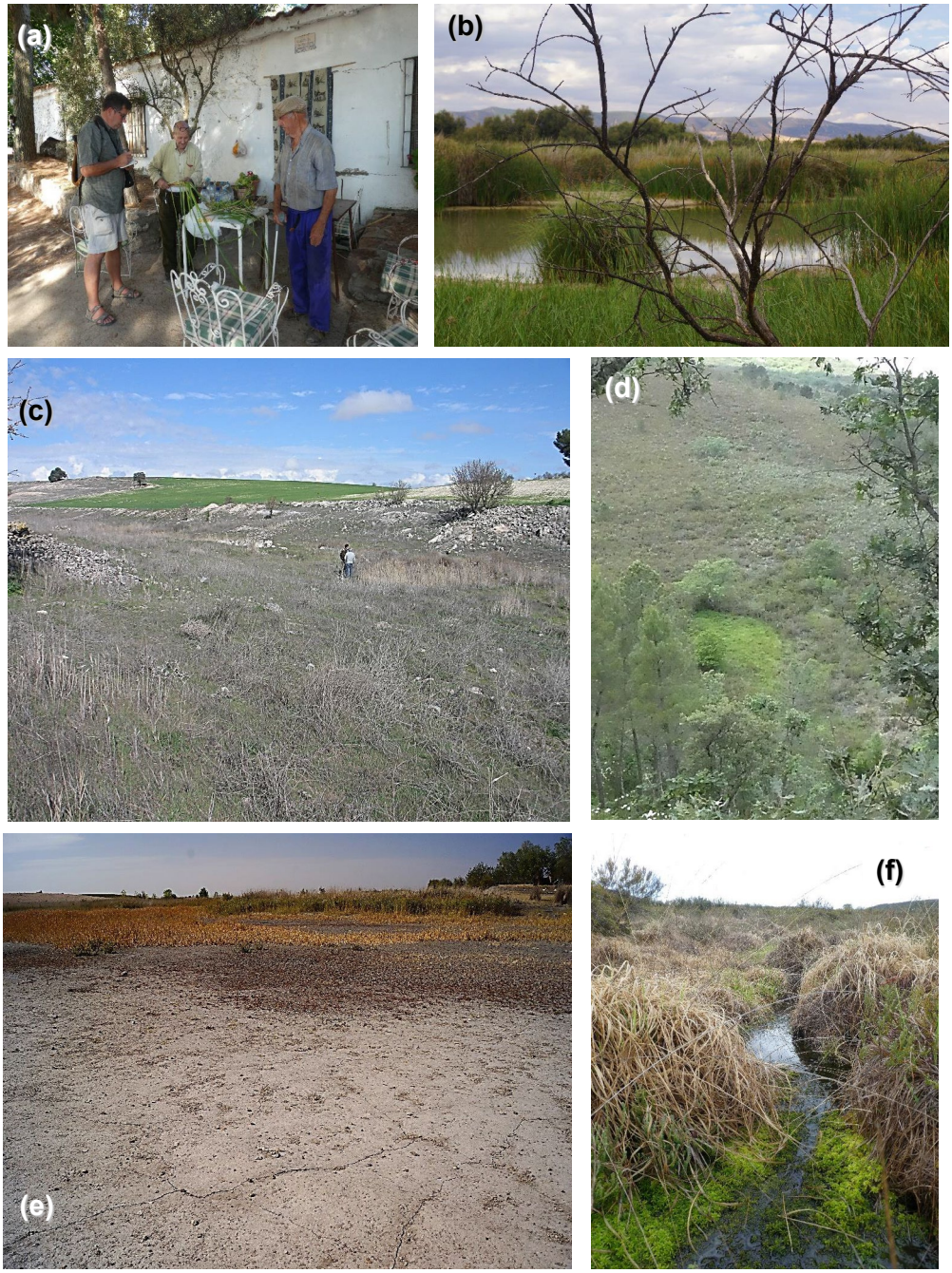

Fig. 4. Wetlands and their degradation as a resource for basketry: **a,** informant identifying extinct *Carex riparia* from a botanic garden specimen; **b,** Tablas de Daimiel; **c,** dessicated "Ojos del Guadiana"; **d,** bog with *Molinia caelurea* in Las Hunfrías (to the north of Cabañeros); **e,** dry bed of the Guadina river at Zuacorta, autumn 2017; **f,** *Carex* bog in El Alcornocal [photos: A. Verde and D. Rivera].

the extension of most of them was seriously reduced. The greater pond-sedge became presumably extinct, at least according to our informants who previously have used this species, forcing our research team to collect some living specimens among those grown in the Botanical Garden of Castilla-La Mancha for showing them to our informants in order to determine the meaning of the *espadilla* vernacular name (Fig. 4a).

Traditional jobs related to wetlands and basketry materials

With very few exceptions (Martín & al. 2004), basketry in the upper Guadiana river area was not a commercial business, it was merely a complementary activity designed to provide the local with the necessary commodities for their life. In this sense, the fishermen of the Guadiana stand out in the area. However, some specific jobs related to wetland plants and basketry were identified. The *carriceros* gather and work with reed for basketry and, mainly, thatching traditional buildings (Fig. 1a). The *zarceros* also work with reeds making awnings for patios and blinds for windows and doors by sewing the stems of the reeds in long strips (Martín & al. 2004). Another job was *eneero,* people who cut, from June till November, and sale the cattail (*enea*) leaves (Escuderos 1996). The *silleteros* make seats for chairs or repaired damaged seats by braiding cattail leaves. This was also a work developed by some entire families without distinction of age or gender. In this job, women were engaged, primarily, to the search of clients and transport of chairs (Clemente 2013). As mentioned above, the wickerwork was the task of *cesteros* or *canasteros,* a job shared by men and women (Clemente 2013; Martín & al. 2004). *Espadilleros* were the people who worked *espadilla* or greater pond-sedge (Álvarez-Cobelas & al. 1996). Now it is impossible to find the *espadilla* in this area, but it is not due to overexploitation but to the severe degradation of its natural habitats. In California Native Americans digging for sedge roots was almost exclusively a task reserved for women (Peri & Patterson 1976) which here is not the case. Finally, there was also a job (*maseguero*) whose main task was cutting and trading the swamp sawgrass, which is an helophyte but not directly related with basket weaving. It is traditionally recognized that *masegueros* and other workers collecting helophytes for basketry helped to maintain open areas with low density of vegetation in the lagoons, thus benefiting the navigability and facilitating the passage to the fishermen.

Collection and storage techniques for basketry materials

Each plant species presents an optimal time for its collection, normally, summertime is the most common in the Guadiana and neighbouring wetland areas.

After cattail leaves are cut, they are spread out in the sun for a few days to dry well and whiten. In the drying process, the leaves are turned over so that they reach a uniform colour on both sides.

To handle wicker, suitable willow branches were used either peeled (white) or with their bark. Basket-makers prepared willow branches before peeling them, normally by soaking or cutting in the right period, when the plant starts to budding or in summertime (St Jacques, July, 25th is a commonly referred day to perform this task). To use willow for baskets, people coppice the trees by cutting all the branches every year, (pollarding, promoting the growth of a dense head of foliage and branches), giving the plant a specific shape called *cabeza gato* (cat head).

In the case of esparto grass, from which leaves are used, these are collected using a special tool called *talí, cogedera* or *palillos*, a kind of wooden or metal rod finished in a truncheon. The leaves are rolled in this rod by the tips so that when stretching, small bunches are removed. However, we recall that esparto grass is gathered far away from the Guadiana river area.

Usually, in the study area, basket-makers must prepare previously the materials before working with them. This material must be kept in the best conditions. People store the dried raw material in a specific room in the house. In these conditions, plants could be stored for years. To prepare for weaving soaking is needed. Only the amount of material that is going to be worked during the day is humidified because if it gets wetter for a longer time, the material can mold and spoil. When a job is done in several sessions, the woven part does not need to be moistened again, only the elements that are not braided.

In the selection of the material for the basketry work, it is intended that all the elements used have a similar diameter and appearance. Materials that are damaged, stained, too thick or too thin are discarded.

Main weaving techniques

Braiding and sewing.—Coiling, sewing and braiding were the major techniques recorded (Fig. 5). Depending on their characteristics (hardness, flexibility, thickness) the different species are used or not in the different techniques. We did not record the use of colorants in the materials studied in the upper Guadiana river area unlike other regions (Merrill 1922; Kuoni, 2003; Potter & Focht 2010).

As a raw material for the braid, cattail and esparto grass were the most used species and, to a much lesser extent, maize. A continuous braid is made and subsequently sewn. There are different sorts of braids, depending on the number of strands and the way of weaving. The bigger braids are called *pleita* woven with the strands up; *crineja* is smaller and woven with the strands looking down. The widths of these braids are determined by the number of branches or

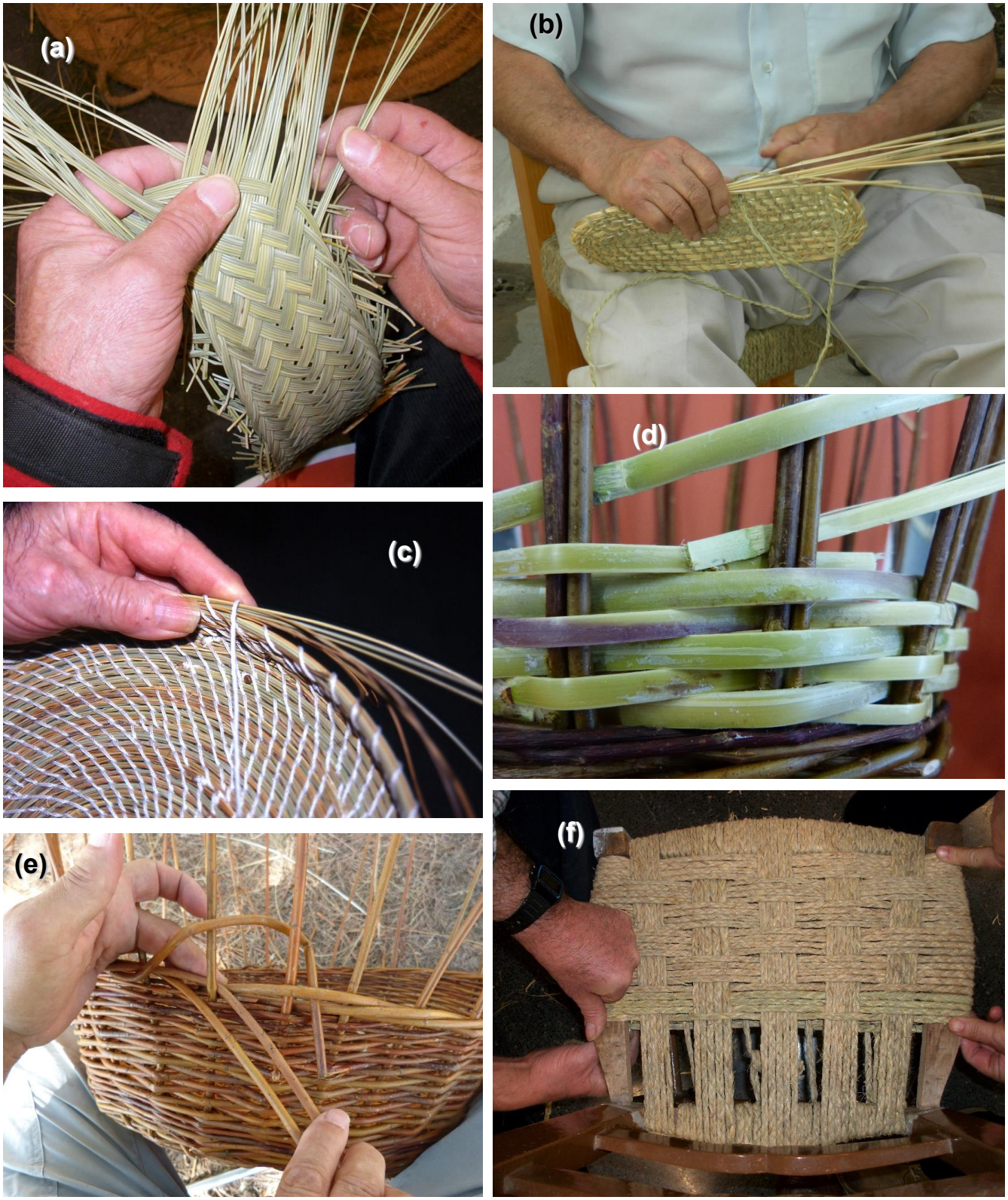

Fig. 5. Basketry techniques: **a,** braiding (*Stipa tenacissima*); **b,** coiling (*Secale cereale*); **c,** coiling (*Stipa tenacissima*); **d,** twining (*Arundo donax*); **e,** twining (*Salix*); **f,** weaving a chair seat (*Typha*) [photos: J. Fajardo].

lines with which they are made and by the number of elements that make up each of the branches (Fig. 5a). So that the work is well it is essential that all the branches have a similar thickness, for these new elements are added continuously. The position of the hands, the gesture, is essential so that the braid is uniform and clean.

From the same type of braid, a great variety of pieces can be elaborated. What determines the final work is the sewing of these braids. In general, there are two different types of sewing, round sewing in which a spiral is formed from the beginning of the braid; and the sewing in parallel in which several *pleitas* are sewn longitudinally. The choice depends on the piece to be made and its design. A special piece made with this technique is the traditional mold for the cheese called *cincha* or *pleita*, it is made with a broadband of *pleita de esparto*, usually of 17 or 19 branches (Fajardo & al. 2015).

For sewing, people use a string made with fibres of galingale or *juncia* (*Cyperus longus* Boeckeler), black sedge or *almorchín* (*Schoenus nigricans* L.) or esparto grass. The string used for sewing have two or three strands and is known as *cosedera* and often is made with different plant species others than the species used in the main braid. If the piece is well sewn, the seam must always be hidden inside the fabric, so that on both sides of the seam the strands intertwine. The string used for sewing is known as *cosedera* and often is made with a different plant species. The needle is made of iron or with a bone of a sheep-leg or with rockrose or *jara* (*Cistus ladanifer* L.) wood. Many traditional pieces were made with this technique, especially baskets to carry water (on clay pots) on horses or big baskets for grape harvesting (*espuertas*).

Twining.—The technique is used with wicker (Fig. 5e), giant reed (Fig. 5d) and rushes, crossing two elements. One is fixed and the other one cross over the first (Fig. 5d). The piece is made directly, without sewing. This technique was used to weave fishing traps (*garlitos* and *nasas*). This is customary in the traditional Roma basketry (Rivera & Obón 1991). This technique is based on weaving a moving element (weft) over other fixed (warp) so that the piece is being made as it is knitted. A piece of this type widely known and formerly used in the area is the *garlito* (Fig. 6d).

Ropes.—Rope weaving is essential in basketry, especially to prepare the strings to sewing pieces. But, this is not the single one purpose. Ropes are used to make a particular type of chair seats (Fig. 5f). Some plants, as *galingale*, are especially used to make ropes. A specific rope type is used to hang melons (*Cucumis melo* L.) at home. Melons are a typical crop and very important in the diet of this area. To keep it fresh more time, the traditional way is hanged with a rope. For some species, like black sedge, people had to beat the plant to free the fibres, before making the rope. Most of these ropes are used as string to sew braided pieces.

Gathering wild asparagus (*Asparagus acutifolius* L.) is very popular in the region. One way to wrap the handful of collected asparagus is by peeling a stem flax-leaved daphne (*Daphne gnidium* L.), using its bark as a rope. Moreover, a rope of bark of this plant was used also to castrate goatlings or lambs.

Coiled basketry.—The distinctive feature of this type of basketry is its foundation, which is made up of a single element, or standard, that is twisted in a continuous spiral around it (Balfet 2019) (Fig. 5b). This easy technique was used especially in straw basketry, mainly with rye-straw but also with wheat or esparto grass, sowing every round of the piece over the former one. Using two elements, a small handful of fibre which constitutes the body and a rope which is used for sewing the piece. This technique, although rare in the Guadiana area, is specific for making some basketry pieces.

The fibre bundle that forms the body of work must maintain a continuous thickness (Fig. 5c), for this, it is fundamental to continuously incorporate new elements and that these additives do not stand out or protrude from the body of work. In each round, the mallet is held on the previous lap sewing with a needle forming a point that forms a radial shape on one of the faces of the piece. In the domestic equipment of La Mancha and the upper Guadiana river area, three basic pieces were made with this technique using rye straw as a material, which was sewn with an esparto grass seam. These three pieces were *escriño*, *panadera*, and *escriñete de la ensancha* (see section Containers and utensils for agricultural practices for details).

Other definite techniques.—Some pieces are decorated with ornaments, often made using specific techniques. There are various braids used for handles and other endings such as trims and ornaments. Each of these techniques receives a specific name based on the number of branches with which it is made. Thus, there are *soguillos* with five and with eight, or with four, called *rabogato*. The redondo has a variable number of branches and the cordón three, etc. The completions of the pieces indicate the quality level of the works. A common ornament in the area is the *calabacillas* (small gourds), tassels which are hanged down in the *frontiles* (a piece in the cow front to hold the yoke) (Fig. 7a) (Fajardo & al. 2015; Barber & al. 1997).

Upper Guadiana river area basketry artifacts

The diverse basketry commodities covered the fishermen needs, for their work in the Guadiana river, but also for their households and their animals, especially horses or mules (Table 4, Figs. 6, 7). Besides the fishermen, these

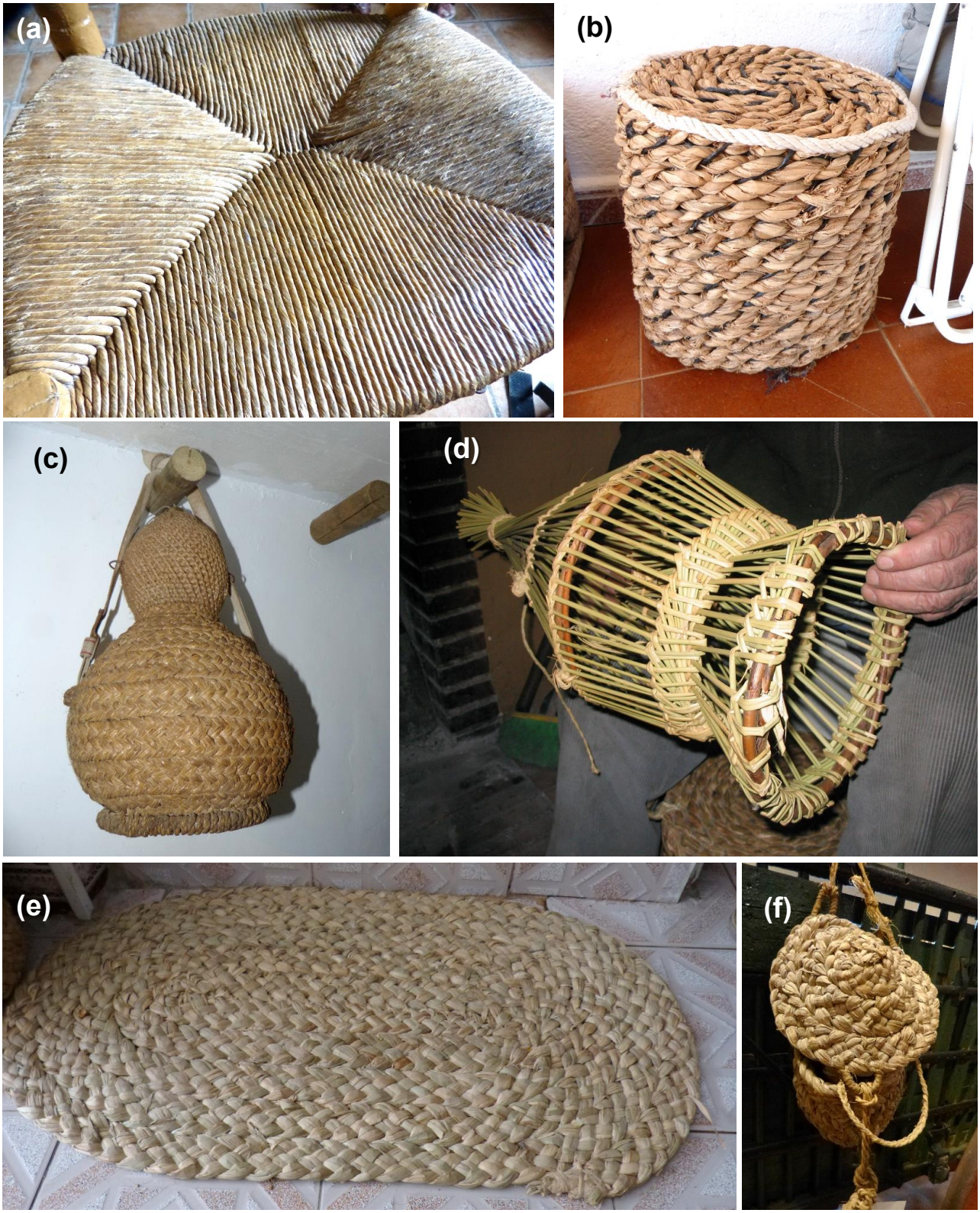

Fig. 6. Basketry typology I: **a,** chair seat made of *Carex riparia*; **b,** puff or small seat (*posete*) made of *Typha*; **c,** gourd covered made of *Stipa tenacissima*; **d,** *garlito* made of *Salix* twigs and *Scirpoides holoschoenus*; **e,** rug made of *Typha*; **f,** bag made of *Typha* [photos: A. Verde and J. Fajardo].

crafts have disappeared, especially regarding their context of uses and functions. Some pieces like *garlitos* (Fig. 6d) could be found in the shops for tourists, for example in the Visitors Centre of the National Park of Tablas de Daimiel. Just a few basket-makers maintain this knowledge in the area, some sell their works for tourists, and others simply make them as a hobby. The people of the river, fishermen but also basket makers, made several pieces of basketry with three main different purposes: fishing arts; household equipment; and containers and utensils for agricultural practices.

Garlito (Fig. 6d) is a fishing trap, a specific basketry piece for fishermen. There are specific garlito types for trapping fish or crabs. It´s a structure formed by two parts, a piece called mouth (boquilla), on which another is inserted, the mantle (manto), which acts like a fish container. The mouthpiece is a ring that can be prepared of different plants, mostly olive shoots or wicker. On this hoop, the craftsman adds, in parallel, wickers or rushes that will make up the mouth, a funnel-like structure through which the fish or crabs must pass. The mouth is closed at the top with a cord of esparto grass or other material forming a belt on which the second part of the garlito is mounted, the mantle. This mantle is braided similarly to the mouth. Once all the wickers have been assembled, another rim is wrapped inside that reinforces the structure that is closed with another upper cord.

To fish with these traps, the fisherman must put the bait inside, fixed with a rush. The main baits were snails, salted sardines, local fish, frogs and others. To protect the bait against the crabs (to increase the useful time) people covered it with rushes, leaving inside and hide the bait (ANTC 2016). The fishermen leave these traps opposite to the water stream, avoiding the entrance of substances, branches, leaves, etc. They arrange the traps during the afternoon/sunset, checking it the next morning. *Garlitos* did not last long in the open in dry environment, and it was known that, if maintained often submerged, they lasted longer. It seems that there was a time when the *garlitos* traditionally made with rushes was replaced by wicker, more durable (from a few months to a couple of years). Julio Escuderos, Daimiel fisherman, was a pioneer in this process.

Trasmallos (fishing nets) were used to capture small fish, since big fish were catched with a specific tool called *rejaca*, a kind of trident. Formerly, fishermen made their own fishing nets, using a rope of cotton, bought in the market. Nets have double layer forming bags (*arbitranes*) to keep fish inside. To keep the net inside the water, they added in one side of the net a row of lead weights, made at home using a specific tool named *turquesa*, a sort of iron crucible. Each fishermen family had their own crucible. On the other side of the net, they added several pieces of cork, to keep it floating. Finally, to dye the net, they used a decoction of bark from holm oak roots [*Quercus ilex* subsp. *ballota* (Desf.) Samp.] dying the net in reddish.

Pieces used for transporting materials and agricultural products are known as *banastas, cestas, covanillos, escriños, escusas, espuertas, paneras, serijos,* and *serones* (Figs. 7c, d). They have different sizes and are made with different species. Some have handles, others covers and others lack these pieces (Table 4).

Other household equipment

The *escriño*, a trunk-conical basket with two handles and reinforced with a wooden cross at its base, this piece was used to bring the bread dough to the oven.

The *panadera*, taller, cylindrical and widened in its upper part, was used to store the bread (about a week).

The *escriñete de la ensancha*, small and provided with lid, was used to maintain the sourdough (*ensancha*) until the next time it went to the oven.

Chair seats (Fig. 7a): covering the frame of a chair was a typical basketry work in Spain. The more important plant for this in the Guadiana river area was cattail, but also greater pond-sedge was very appreciated in fine chair making, even this species was cultivated for that purpose in Eastern Spain (Kuoni 2003). Even whole small seats (*posete*) which also could be used as a recipient were made with cattail (Fig. 6b).

Mattresses: formerly, the mattresses were filled normally with plants. Only the best and more expensive were filled with wool. People used as fill plants without other better uses as some helophytes or maize straw (Tables 2, 3). Social changes in the last forty years have led to the cessation of this use, so its impact on the ecosystem is zero. But if the population had grown and the use had been maintained, its impact could have been serious as in the case of overexploitation of cattail and *Cyperus* species within Chefa Wetland in Ethiopia due to the industrialization of the mattress filling activities (Tessema & al., 2013).

Harnesses to hold oxen, mules and donkeys and their loads were made sometimes with esparto grass or other fibres, making a wide braid to different parts.

Notwithstanding the abundance of cattail we did not recorded in this area such uses as the manufacture of curtains which instead were common in the Hamun lake area of Iran before its partial desiccation (Parsapajouh & Ghahremaninejad 2004). Instead, we recorded the use of rushes in the manufacture of curtains (Fig. 7b). In the case of production of mats or rugs (Fig. 6e) using cattail, we found coincidences with the report of Parsapajouh & Ghahremaninejad (2004) for the Hamun area.

Table 4. Types of pieces, techniques and plant species used in the upper Guadiana river area (Spain). Definitions are based on the "Diccionario de la Real Academia Española" (DRAE 2018).

Spanish name	Name and definition	Plants used	Techniques	Uses
Fishing tools				
Garlito (Fig. 6d)	*Fish trap.* Fishing gear consisting of a basket of conical shape made of interwoven twigs with a funnel directed inwards at its base, arranged in such a way that, once the fish enters, it can no longer exit.	*Scirpoides holoschoenus* / *Salix* spp. / *Vitis vinifera* / *Olea europaea* / *Tamarix canariensis*/ *Juncus acutus*	Twining	Fishing
Nasa	*Fishing basket.* Wicker cylinder of interwoven twigs, with a kind of funnel directed inwards in one of its ends and closed with a cover in the other to empty it.	*Salix* spp.	Twining	To keep fishes and crabs alive
Transport tools				
Aguaderas	*Pitcher basket.* Frame with divisions that is placed on the donkeys and mules to carry pitchers of water or other things.	*Typha* spp. / *Stipa tenacissima* / *Cyperus longus* / *Stipa gigantea*	Braiding and sewing	To carry water or other things in pitchers or barrels
Albarda	*Pack saddle.* Main part of the rigging of the load horses, which is made up of two pieces, like pillows, usually stuffed with straw, and joined by the part that falls on the back of the animal.	*Schoenoplectus lacustris* / *Secale cereale* / *Typha* spp. / *Cyperus longus*	Braiding and sewing	For donkeys and mules so the load does not hurt them
Banasta (Fig. 7c)	*Hamper.* Large wicker or esparto grass basket formed of interwoven twigs or braided esparto.	*Salix* spp. / *Stipa tenacissima*	Twining, braiding and sewing	Transport of fruits or other merchandise
Cesta	*Wicker basket.* Wicker container woven with wicker twigs.	*Salix* spp.	Plaited, sinnet, stitched coiled, cross warp, twining	Transport of clothes, fruits and other objects
Covanillo (little *cuévano*) (Fig. 7d)	*Grape harvest basket.* Conical and deep basket of wicker, cattail or esparto grass.	*Typha domingensis* / *Stipa tenacissima*	Braiding	Transport of grapes in the vintage
Escusa (*escusabaraja*)	*Picnic basket.* Esparto grass or cattail basket, with lid.	*Typha* spp. / *Stipa tenacissima*	Braiding and sewing	To carry meals to the fields
Espuerta	*Field basket.* Basket with two handles.	*Stipa gigantea* / *Stipa tenacissima* / *Typha* spp.	Braiding and sewing	To move debris, earth or others
Escriño	*Rye straw basket.* Basket made of straw, sewn with esparto grass.	*Secale cereale* / *Stipa tenacissima*	Coiled basketry	To store food; to transfer dough to the oven
Serijo / posete (Fig. 6b)	*Cattail puff.* Cylindrical seat made of cattail.	*Typha domingensis*	Braiding and sewing	To sit on
Serón	*Donkey pannier.* One piece braided transport implement in the form of two conical baskets joined by a flat central area.	*Typha domingensis* / *Stipa tenacissima* / *Cyperus longus*	Braiding and sewing	To load donkeys and mules with crops or fodder
Solera	*Cart rug.* Esparto grass mat for the farm cart floor.	*Typha domingensis* / *Stipa tenacissima*	Braiding and sewing	To cover the the carts floor
Home commodities				
Asientos de sillas (Fig. 5a)	*Chair seat.* Part of a chair on which one rests in sitting, made of cattail or other materials.	*Carex riparia* / *Typha* spp. / *Stipa tenacíssima* / *Schoenoplectus lacustris*	Braid, string	To sit on
Persianas (Fig. 7b)	*Outside mount shades.* External closing of a door or window formed by sewn twigs.	*Scirpoides holoschoenus*	Sewing	To regulate light and control privacy
Estera (Fig. 6e)	*Natural fiber rug/mat.* Thick fabric of esparto grass, rushes, etc., or formed by several sewn *pleitas.*	*Zea mays* / *Stipa tenacissima* / *Typha* spp.	Braiding and sewing	As room floor cover
Garrafas forradas (Fig. 6c)	*Cattail covered wine bottles or gourds.* Wine carafes lined with cattail or esparto.	*Typha* spp. / *Stipa tenacissima*	Braiding and sewing	Protection of glass bottles
Jergón	Mattress. Stuffed with straw, grass or esparto.	*Scirpus maritimus* / *Carex* spp.	Filling a bag with plants	For beds
Panera	*Breadbasket.* Large basket without handle	*Schoenoplectus lacustris*	Coiling	For bread
Redor	*Round mat.* See *Estera.*	*Stipa tenacissima* / *Typha domingensis.*	Braiding and sewing	As room floor cover
Sombreros	*Hat*. Garment to cover the head, consisting of cup and wing.	*Secale cereale*	Several	To protect the head
Agriculture				
Frontil mosquero (Fig. 7a)	*Fly veil.* Piece of esparto grass, which is put to the cavalries on the forehead.	*Stipa tenacissima*	Braiding and sewing	To keep flies away

Fig. 7. Basketry typology II: **a,** *frontiles mosqueros* for oxes; **b,** Curtain made of *Scirpoides holoschoenus*; **c,** *Stipa tenacissima* hamper to transport olives; **d,** *Covanillos* made of *Thypha* [photos: J. Fajardo].

Brooms

Brooms are a very popular craft in the area and they are made using wild or cultivated plants (Table 5, Fig. 8) as in other European areas (Dogan & al. 2008, Nedelcheva & al. 2007). There are two types of brooms, rough brooms used to sweep the field and other outdoor areas, and finer brooms used to sweep the interior of the houses, chimney or dust as a duster. Worn brooms have been used to white-wash or paint the walls of houses (Fajardo & al. 2000; Fajardo & al. 2007; Verde & al. 2000). We have identified 20 plant species used to make brooms, 15 for rough and three for fine brooms. They belong to 11 botanical families and the family with a greater number of species is Poaceae (six) followed by Asteraceae with three species.

Unlike in the case of local basket weaving, in the manufacture of brooms there are more numerous species used from the dry habitats that surround the wetlands. However, the eight species from wetlands, streams and orchards are common.

Fig. 8. Brooms: **a,** making a broom with *Sorghum bicolor* and *Stipa tenacissima*; **b,** man with a broom of *Molinia caerulea*; **c,** broom of *Sorghum bicolor*; **d,** *Erica* broom; **e,** broom of *Agrostis castellana* [photos: A. Verde and J. Fajardo].

Table 5. Species used to make brooms in the upper Guadiana river area (Spain). Dry habitats include natural and cultivated areas.

Taxa / Habitats	Local name	Uses
Wetlands and water fields		
Cyperaceae		
Schoenus nigricans L.	Almorchín	Front and backyards
Ericaceae		
Calluna vulgaris (L.) Hull	Mogariza	Front and backyards
Erica tetralix L. (Fig. 8 d)	Brecina	Front and backyards
Juncaceae		
Juncus acutus L.	Junco merino	Front and backyards
Oleaceae		
Olea europaea L.	Oliva	Outdoors, sweeping manure in farmyards
Phyllanthaceae		
Flueggea tinctoria (L.) G.L.Webster	Tamujo	Outdoors, sweeping manure in farmyards
Poaceae		
Molinia caerulea (L.) Moench (Fig. 8b)	Escoba de las eras, mansiega	Front and backyards
Sorghum bicolor (L.) Moench (Fig. 8a, c)	Escobas de año	Indoors
Dry habitats		
Amaranthaceae		
Salsola vermiculata L.	Calamino	Front and backyards
Compositae		
Artemisia campestris L.	Tomillo cominero	Front and backyards
Centaurea aspera L.	Amargas	Front and backyards
Mantisalca salmantica (L.) Briquet & Cavill.	Cabezuela	Front and backyards
Leguminosae		
Cytisus scoparius (L.) Link	Iniesta	Front and backyards
Retama sphaerocarpa (L.) Boiss.	Retama	Front and backyards
Oleaceae		
Phillyrea angustifolia L.	Labiérnago	Front and backyards
Orobanchaceae		
Odontitella virgata (Link) Rothm.	Algarabía	Front and backyards
Poaceae		
Agrostis castellana Boiss. & Reut. (Fig. 8e)	Heno	Front and backyards
Agrostis nebulosa Boiss. & Reut.	Barresanto	The finest one, indoors
Stipa offneri Breistr.	Cerrillo	Indoors
Stipa tenacissima L.	Esparto	Front and backyards

Broom corn is specifically grown in the vegetable watered gardens to produce the fibers needed to make brooms, the part used is the panicle. Some brooms are made to clean outdoor spaces like yards or plots, others are used at home, even to clean dust over the furniture. This species has been used in other villages of Cuenca, Albacete and Ciudad Real (Spain) (Verde & al 2000; Fajardo & al. 2000; Fajardo & al. 2007).

Heather brooms (*Erica* spp.) are used in various places in Spain in the sweeping of public spaces and also are commercially sold. The genus *Erica* is often used for brooms in other countries such as Italy or Bulgaria (Nedelcheva & al. 2007). *Cytisus, Genista* or *Retama* brooms are used throughout Spain in cleaning pens and gardens (Rivera & Obón 1991), and also *Genista* is used in Italy (Nedelcheva & al. 2007).

The technique to make a broom is fairly easy, just putting together a plant handful and wrapping with a specific knot, which tightens very hard the broom and forming a handle to hold it. The plants must be collected before flowering and the harvesting is usually done by means of a sickle or croaker. The beams of the plant are tied using some element that allows tightening the broom as much as possible, tensing the rope while it goes rolling.

CONCLUSIONS

The upper Guadiana river wetlands and surrounding areas provided the local traditional communities with numerous resources necessary for their life. They include plant materials for basketry and the manufacture of brooms. An extremely rich number of species of plants, 30 species belonging to 12 families, are or have been used in the past

for basketry in the study area. Wetlands and irrigated fields are the major source of basketry materials within this area. Brooms are made with a wide number of species that are selected depending on the main purpose of each broom type. Unlike other basketry materials, the manufacture of brooms requires fewer resources from wetlands. The basketry types recorded are linked to the traditional way of life in the area, especially the art of fishing and the manufacture of brooms and their use was widespread in the area, even at commercial level.

The degradation and loss of wetlands in La Mancha (Spain), due to overexploitation of aquifers, occupation for urban or agricultural developments and climate change, threatens these ecosystems and their biodiversity, but also the cultural heritage linked to this unique group of ecosystems. Therefore, it is extremely important to incorporate these traditional uses, which include basketry, broom-making and many others, within the foundations of the conservation/exploitation of natural resources in wetlands under legal protection, within a framework of sustainability and involvement of the local population in the tasks of preservation of habitats and biodiversity and the associated sustainable traditional uses.

Knowledge on plant species and techniques used to make basketry and brooms is a relevant heritage to be preserved. Traditional knowledge related to basket weaving must be conserved, not merely as it was in the past, but also adapted to new cultural and social contexts, such as recreational basket weaving. Given the uniqueness and specialization, adaptation to the environment and the fragility of these humid habitats, we believe that it is urgent to promote the declaration of the "Culture of the Mediterranean Wetlands" as intangible human heritage, as well as to culminate the ongoing process of the declaration of the "Esparto Culture".

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