

IDENTIFYING NATURA 2000 HABITATS IN THE WATERSHED OF THE MIDDLE SECTION OF THE DEVOLL RIVER (SOUTHEAST ALBANIA)

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Meço, M., Mullaj, A., Mesiti, A. & Mahmutaj, E. (2018): Identifying Natura 2000 habitats in the watershed of the middle section of the Devoll river (Southeast Albania). – *Studia bot. hung.* **49**(2): 73–81.

Abstract: The watershed of the middle section of the Devoll River is located between the districts of Korçë, Pogradec, and Gramsh. The geographical location of this area, complex topography, climate characteristics, different rock substrates and soil types as well as hydrological conditions, contribute to a rich flora and diversity of natural habitats. Our main goal was the identification and mapping of Natura 2000 habitat types within the study area, based on mainly their typical plant species. The mapping was carried out during the period 2016–2018. The most representative habitats in the area are: (sub-)Mediterranean pine forests with endemic black pines (9530), Pannonian–Balkan turkey oak–sessile oak forests (91M0), *Quercus trojana* woods (9250), and *Quercus ilex* and *Quercus rotundifolia* forests (9340).

Key words: field study, GIS, forests, maquis, riparian vegetation

INTRODUCTION

The watershed of the Devoll River is located in the southeastern part of Albania where a relatively more continental, sub-alpine climate prevails, but with Mediterranean influences in the lower altitudes. The study area covers the watershed of the middle section of the Devoll River. Its surface is around 1,017 km², about the 3.5% of the area of Albania. Due to the high range of altitudes (from 100 m to 2373 m), the complex topography, the highly variable rock substrates, soil types, and hydrological conditions, a wide diversity of vegetation and habitat types are found within the study area (KABO 1990, 1991, NORCONSULT 2010).

The diversity of vascular plants is remarkable in the study area. Altogether 1,224 taxa are reported in a recent study including 3 taxa reported for the first time in Albania (MEÇO *et al.* 2018a). About 1.9% of the flora of the study area consists of endemic and subendemic taxa of Albania of which *Halacsya sendtneri*

subsp. *devollensis* is a stenoendemic taxon of Devoll watershed. Of particular importance there are also 167 taxa endemic of the Balkans and 261 taxa that have a conservation status according to the Albanian and/or IUCN red lists (in Albania, the plants in the official red list are protected by law). This floristic richness has attracted interest also for their economic values because 25% of the flora of the study area is represented by plants of economic value from which the medicinal-aromatic plants (177 taxa) are of particular importance as they are one of the main sources of economic income for the rural population (MEÇO *et al.* 2018b).

In the study area four altitudinal vegetation belts are present: 1) xerophitic evergreen forest and shrubland, 2) thermophilous broadleaved oak forests and all other derived degradation stages, within this series, 3) mesophilous broadleaved or mixed forests, dominated by beech (*Fagus sylvatica*) and black pine (*Pinus nigra*) and 4) alpine meadows and dry grasslands with the dominance of *Carex* spp., *Stipa* spp., *Sesleria* spp., *Nardus stricta*, *Festuca* spp., etc.

Little or no information is known about the habitats that cover the area, especially for those of the Annex I of the Directive of Habitats. In this study we aimed to identify and map the Natura 2000 habitats within the study area, using geographical information system (GIS) tools and softwares. This area includes a wide range of modified and artificial habitats. The majority of these habitats are intensively used for firewood collection and grazing. Artificial habitats are represented mostly by agricultural land and pine plantations, but they aren't part of our study.

MATERIAL AND METHODS

The habitats in the watershed of the middle section of the Devoll River were identified according to the Directive 92/43EEC (COUNCIL DIRECTIVE 92/43/EEC 1992). The habitat identification was based on identifying diagnostic species and phytosociological relevés according to the Braun-Blanquet system.

By using the program Arc Map 10.1, on a scale of 1:200,000, a high resolution habitat map was produced. All the data are geo-referenced in the WGS 84 system and in UTM zone 34N. A wide range of maps and records were used to identify the border of habitat plots. Digital imagery was used as the primary data source for mapping. The analysed data sets included large scale vegetation maps (Corine Land Cover map) (DEVILLERS *et al.* 1991) and topographic maps (topographic base map of 1:25,000). Digital orthophotos were taken from the ALUIZNI (Informal Building Legalization Agency, asig.gov.al), were clipped to match the project study area boundaries and were geo-referenced. Field localities and digital maps were connected by data records collected in the field. Information on each habitat type was recorded in a GIS database. All points recorded in the field were accompanied with ecological data and information on

vegetation types and species composition. Since the aerial photos are insufficient to separate and delimit all habitat types, repeated field surveys were undertaken, by making new transects.

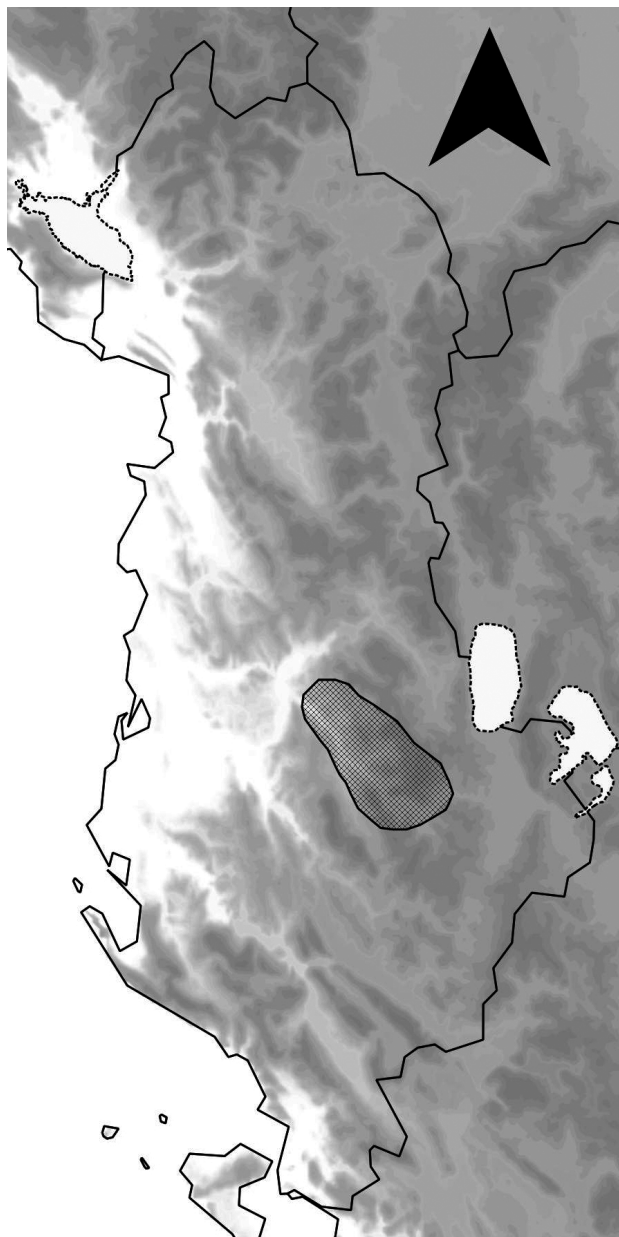


Fig. 1. Map of Albania and the study area (hatched).

Further information in the attribute table has been assigned to each habitat plots (polygons): coordinates, the main communities found in the region and the phytoclimatic belt relevance.

All habitat types and their spatial distribution in the studied watershed area of the Devoll River, which fully correspond to the terms of codes and definitions in the Directive 92/43/EEC (COUNCIL DIRECTIVE 92/43/EEC 1992), were mapped using Geographical Information System (GIS). The analysis of existing data was concentrated at the 1: 5,000 scale.

Seventeen field trips were undertaken and about 1000 GPS points were registered altogether. Subsequent field work missions were undertaken as a quality control measure to verify map information.

For plant identification Flora Europaea (TUTIN *et al.* 1968–1980, 1993) and Flora of Albania (PAPARISTO *et al.* 1988, QOSJA *et al.* 1992, 1996, VANGJELI 2015) were used.

RESULTS

As a result of high biodiversity, the study area supports a wide range of natural and semi-natural habitats, which cover about 73.5% of the study area. 29 habitat types of Annex I of the Habitat Directive (Directive 92/43/EEC) were identified, from which habitats 9530, 9180, 6230 and 91E0 are priority, while the habitat 3240 is reported for the first time in Albania (Fig. 2). The most representative habitat is the (*Sub-*)*Mediterranean pine forests with endemic black pines* (9530). About 22.5% of the study area is covered by habitats 9340, 91M0, 9250, and 9280, which belong to the hierarchical group of thermophilous forests and scrub among which the maquis and oak forests are identified. About 4.1% of the study area is covered by grasslands, belonging to habitats 6170, 6210, 6230, and 6520. From these, around the 36% is covered by the habitat *Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea, 6210)*.

Based on the diagnostic species present in the beech forests of the study area and at the results of the work of HODA *et al.* (2018), we classified these forests in two habitat types: *91K0 Illyrian Fagus sylvatica forests (Aremonio-Fagion)* occurring at intermediate altitude (1200–1500 m) and *9110 Luzulo-Fagetum* beech forests occupying the higher altitudes (1600–1800 m). The impact of human activity is very high through agricultural activity, deforestation for firewood collection, grazing, livestock, etc. As a result, about 26.5% of the study area is covered by modified and artificial habitats which are not included and classified in the present habitat map. In the Natura 2000 habitats map (Fig. 2) all these areas are marked with white colour.

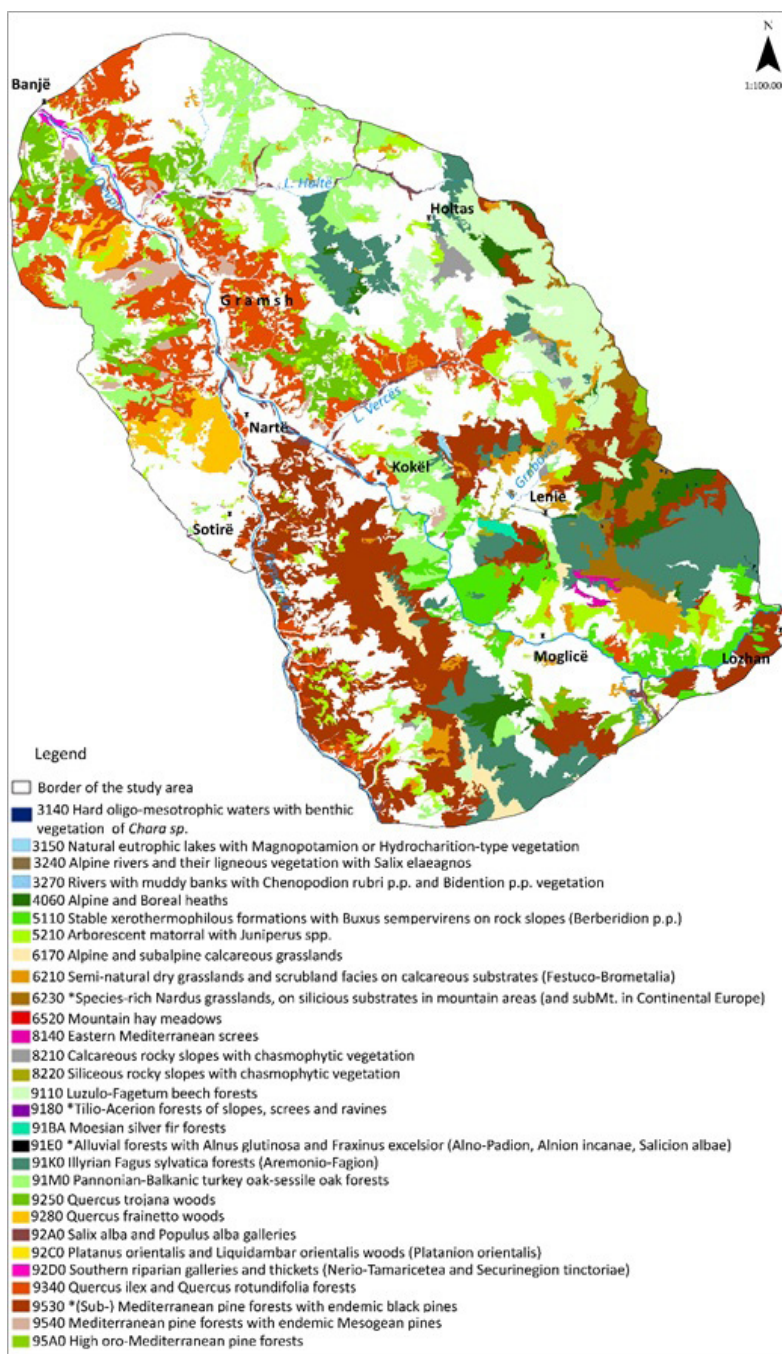


Fig. 2. Natura 2000 habitats map of the study area.

DISCUSSION

The study area is considered as an area of high biodiversity value, which results from the geographic position and high differences in altitudes, microclimate elements, mountains, edaphic factors and, to some extent, due to the various forms of traditional use of the forest areas and plants. These are reflected even in a wide range of natural and semi-natural vegetation types and habitats. Semi-natural and modified habitats, especially those intensively used for firewood collection and grazing, constitute the majority of the habitats present, while artificial habitats represented mostly by pine plantations on eroded slopes only cover small sections of the study area.

Habitat types in the watershed of the middle flow of the Devoll River can be easily classified in three fundamental types: 1) strictly aquatic ones that live in the river-bed or lake and water reservoirs, 2) riparian habitats that grow along the river banks, 3) terrestrial habitats. Most of the aquatic flora consists of algae and taller plants which are suited for humid environments and sometimes even complete immersion, even if temporary. Aquatic plants depend on a riverine environment, and their existence is influenced by many factors. For example, periods of submersion, the aquifer level, the force of the current, the composition of the riverbed, and the transparency of the water all play an important role. Some plants are completely submerged while others root in the riverbed and emerge from the water at various heights. More typical of these vegetation types are the reed beds with *Typha angustifolia*, *Phragmites australis*, and *Typha minima*, which latter is a rare species in Albania.

Riparian vegetation includes shrubs and arboreal species (*Salix alba*, *S. purpurea*, *S. elaeagnus*, *Populus alba*, *Platanus orientalis*, *Tamarix parviflora*, *Alnus glutinosa*, etc.), which are found in areas between aquatic plants and other plant species, with a total surface about 953 ha (0.9%) in the study area. Riparian vegetation of the study area is one of the most important vegetation types but even more endangered from the construction of hydropower plant (HPP). In this vegetation type six Natura 2000 habitats were identified, from which 91E0* is a priority habitat. The habitat most affected by hydropower, the dam of Banja hydropower up to the Gramshi town now fully flooded, is the gallery with *Tamarix parviflora* (92D0).

As regards terrestrial habitats of the studied watershed area of the Devoll River, the habitat 9530* covers a huge part of the study area, about 13,012 hectares (12.8%). The black pine forests are typical above 1000 m but in our study area these formations start from 300 m, often mixed with the elements of the Mediterranean maquis (mainly *Arbutus unedo*) or with the riparian vegetation of the Tomorrice River. In Albania this is not a common situation. Presumably,

the relatively strong influence of continental climate from the upper part of the Devoll and Tomorrica Rivers has created favourable conditions for the establishment of black pine populations in the area between these two rivers.

The habitat types of thermophilous forests occur in the lower part of the study area to about 1000 m above sea level where the Mediterranean climate is dominant. This habitat type is mainly represented by semi-natural grasslands, formed as a result of human activity, such as deforestation and abandonment of agricultural lands.

Habitat 8220, the chasmophytic vegetation of serpentine and siliceous substrates has an outstanding conservational value. This habitat type represents one of the most important habitat types related to important species, i.e. endemic

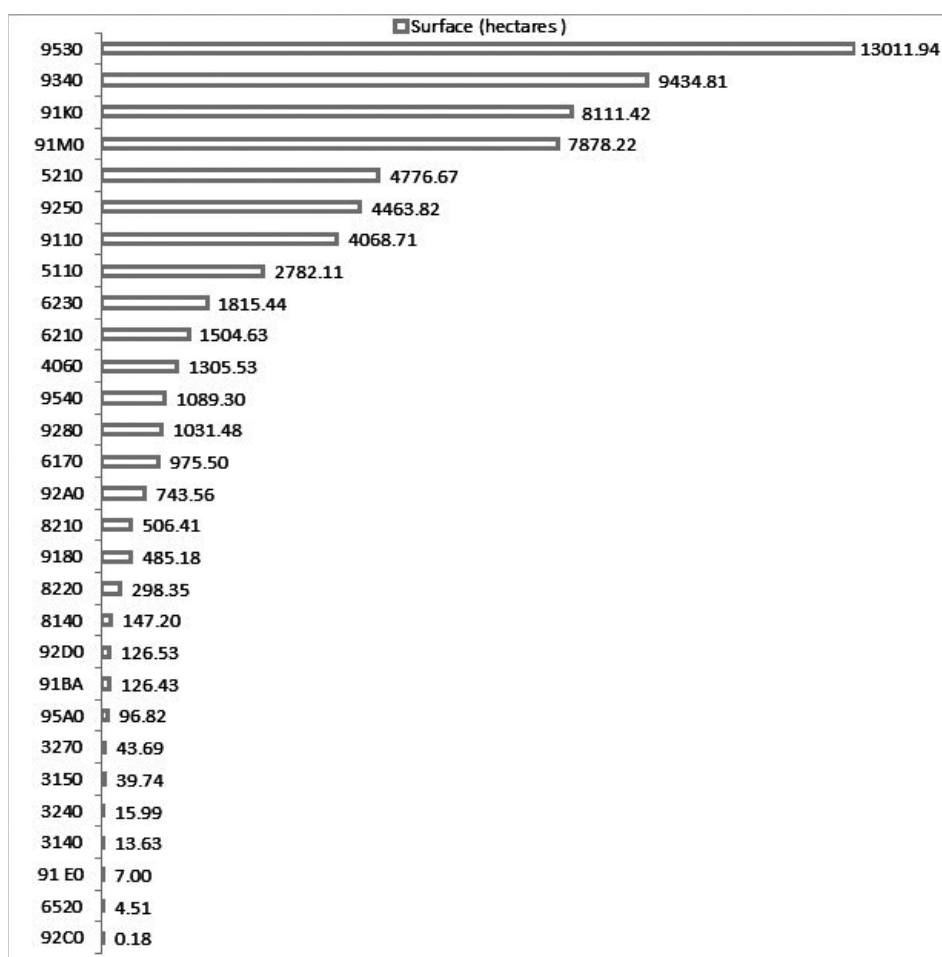


Fig. 3. The surface area of the mapped habitat types.

and subendemic species. FANELLI *et al.* (2018) described a new alliance from the vegetation of silicon-serpentine substrate in our study area and the Shebenik-Jablanice National Park, named Festucopsion serpentine (*Halacsyetalia sendtneri*). Due to its special characteristics, FANELLI *et al.* (2018) have proposed to include this habitat to the Annex I of the Habitat Directive.

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Összefoglaló: A szerzők Albánia középső részén, a Devoll vízgyűjtőjének 1017 km²-es területén végezték el az ott található Natura 2000 élőhelyek tipizálását és térképezését. A vizsgált területen belül az ország legnagyobb részéhez képest kifejezettebb kontinentális hatás érvényesül, az alacsonyabb régiókban viszont tipikus mediterrán klíma és növényzet a jellemző. A térképezéshez georeferált légi felvételeket és topológiai alaptérképeket használtak fel, és 17 terepnap során mintegy 1000 ponton rögzítették az ott található és a környező vegetáció paramétereit.

A munka során összesen 29 közösségi jelentőségű Natura 2000 élőhely előfordulását sikerült kimutatni a területről. Legjelentősebb kiterjedésben a 9530-as kódú *Mediterrán (szubmediterrán) fenyőerdők endemikus feketefenyővel* található meg, emellett jelentős a *Magyaltölgy (Quercus ilex) és kereklevelűtölgy (Quercus rotundifolia)-erdők* (9340), a *Pannon cseres-tölgyesek* (91M0), a *Macedón-tölgy (Quercus trojana)-erdők* (9250) és a *Magyar tölgyesek (Quercus frainetto)* (9280) területaránya. A bükkösöket két típus, az *Illír bükk (Fagus sylvatica)-erdők (Aremonio-Fagion)* (91K0) és a *Mészke-rülő bükkösök (Luzulo-Fagetum)* (9110) képviselik. A *Magashegységi folyók és fás száru vegetációjuk parti fűzzel (Salix elaeagnos)* (3240) élőhelyet most először jelzik Albánia területéről. A gyepek aránya alárendeltebb a vizsgált területen, 4,1%-ot borítanak. Közülük leggyakoribbak a *Meszes alapkőzetű féltermészetes száraz gyepek és cserjésedett változataik (Festuco-Brometalia)* (6210), a *Havas-i és alhavasi mészkedvelő gyepek (6170)*, a *Meszes alapkőzetű féltermészetes száraz gyepek és cserjésedett változataik (Festuco-Brometalia)* (6210), a *Fajgazdag Nardus-gyepek szilikátos alapkőzetű hegyvidéki területeken és kontinentális európai területek domb- és hegyvidékein* (6230) és a *Hegyi kaszálórétek* (6520).

REFERENCES

- COUNCIL DIRECTIVE 92/43/EEC (1992): *On the conservation of natural habitats and of wild fauna and flora*. – <http://eur-lex.europa.eu/legal>
- DEVILLERS P., DEVILLERS-TERSCHUREN J. & LEDANT J. P. (1991): *CORINE biotopes manual. Habitats of the European Community. Part 2*. – Office for Official Publications of the European Communities, Luxembourg, 300 pp.
- FANELLI G., GJETA E., MAHMUTAJ E., MULLAJ A., SALVATORI F. & DE SANCTIS M. (2018): The ophiolitic communities of Shebenik Jablanice National Park (Albania). – *Rendiconti Lincei. Scienze Fisiche e Naturali* 29(2): 309–328. <https://doi.org/10.1007/s12210-018-0694-7>
- HODA P., DE SANCTIS M., FANELLI G., FARCOMENI A., KALAJNXHI A., MAHMUTAJ E., MERSINLLARI M. & ATTORRE F. (2018): *Modelling the Carpino-Fagetea communities in Albania*. – Abstract, 27th Congress of the European Vegetation Survey, 23–26 May. Poland
- KABO M. (1990, 1991): *Gjeografia Fizike e Shqipërisë* Vol. 1–2. – Akademia e Shkencave e RPS të Shqipërisë, Qendra e Studimeve Gjeografike, Tirana, 551 pp.
- MEÇO M., MULLAJ A. & BARINA Z. (2018a): The vascular flora of the Valamara mountain range (SE Albania), with three new records for the Albanian flora. – *Flora Mediterranea* 28: 5–20. <https://doi.org/10.7320/flmedit28.005>

- MEÇO M. & MULLAJ A. (2018b): *Assessing the medicinal and aromatic plants in watershed of the middle section of Devoll River*. – 10th Conference on Medicinal and Aromatic Plants of Southeast European Countries. Split, Croatia, 20–22 May 2018
- NORCONSULT (2010): *Devoll Hydropower Project*. – Development Phase (ESIA Report), Tiranë
- PAPARISTO K., DEMIRI M., MITRUSHI I. & QOSJA Xh. (1988): *Flora e Shqiperise. Vol. 1*. – Acad. Sci. Albania, Tirana
- QOSJA Xh., PAPARISTO K., DEMIRI M. & VANGJELI J. (1992): *Flora e Shqiperise. Vol. 2*. – Acad. Sci. Albania, Tirana
- QOSJA Xh., PAPARISTO K., VANGJELI J., RUCI B. & MULLAJ A. (1996): *Flora e Shqiperise. Vol. 3*. – Acad. Sci. Albania, Tirana
- TUTIN T. G., BURGESS N. A., CHATER A. O., EDMONDSON J. R., HEYWOOD V. H., MOORE D. M., VALENTINE D. H., WALTERS S. M. & WEBB D. A. (eds) (1993): *Flora Europaea, 2nd ed., Vol. 1*. – Cambridge University Press, Cambridge
- TUTIN T. G., HEYWOOD V. H., BURGESS N. A., MOORE D. M., VALENTINE D. H., WALTERS S. M. & WEBB D. A. (eds) (1968–1980): *Flora Europaea, Vol. 2–5*. – Cambridge University Press, Cambridge
- VANGJELI J. (2015): *Excursion Flora of Albania*. – Oberreifenberg, Koeltz Scientific Books, 661 pp.

(submitted: 23.11.2018, accepted: 30.11.2018)