Dragonflies of Moldova: state of knowledge and personal observations

Elena S. Dyatlova[1]

[1] Low Dniester National Nature Park, Frantzuzskij boulevard 89, Ukraine, Odessa 65009.

E-mail address: lena.dyatlova@gmail.com

Abstract

During summer field work in 2005 and 2009 data on the distribution of dragonflies were obtained on the territory of Moldova. In August 2005, 9 species were recorded for the middle part of the Dniester river (surroundings of Sakharna). Between 28 June and 4 July 2009 dragonflies were studied in almost all parts of the country - 25 species were observed. Four species (*Lestes macrostigma, Coenagrion ornatum, Coenagrion scitulum, Orthetrum brunneum*) were recorded for the first time in Moldova. For many species the knowledge of their Moldovan distribution was improved. The habitats of every species were described, illustrated and preliminary maps of species distribution were prepared.

Literature data were also analysed and a check list of Moldovan dragonflies was created containing 37 species. The presence of several species (including *Nehalennia speciosa*) in Moldova needs confirmation.

Introduction

Concerning Odonata, Moldova (see maps in appendix 1 and 2) is one of the most poorly studied European countries. Few publications, most with limited information about Moldovan dragonflies exist (Artobolevsky, 1917; Bezvali, 1932; Brauner, 1910; Andreev, 1998; Osenimskiy, 2006) but the geographical locations of some of these records could not be precisely reproduced. Three sources referring to dragonflies of Moldova contain information from Romanian territory (Cîrdei, 1956; Prunescu-Arion, 1969; Cîrdei & Bulimar, 1961).

Methods

In August 2005, data were collected in the Sakharna village surroundings, the middle part of the Dniester river. Between 28th June and 4th July 2009 dragonflies were collected in sites in almost all parts of the country. Literary data were analysed and geographical coordinates of literary records were found (maps, Appendix 4). Mostly adults were studied in this research.

Results

Twenty-five species were observed during 2009 fieldwork, four (*Lestes macrostigma, Coenagrion ornatum, Coenagrion scitulum, Orthetrum brunneum*) recorded for the first time in Moldova.

For many species we improved our knowledge of their Moldovan distribution. All habitats are described and some are illustrated. A checklist of Moldovan odonates contains 37 species (see pages 21ff and Appendix 3, tab. 1). For several species (*Lestes viridis, Nehalennia speciosa*, *Aeshna juncea, Erythromma lindenii*), a confirmation of their presence on the territory of Moldova is needed.

Preliminary maps of species distribution were created based on personal and literature data (Appendix 4).

The pictures of visited Sample sites and maps of species distributions are also available on Internet: http://picasaweb.google.com/OdonataMoldova.

Sample site 1

Date of survey: 28.06.2009.

Geographic coordinates: N 46°09'12.6" E028°37'36.4" (26 m above-sea level [a.s.l.])

Locality: Surroundings of Kongaz.

Habitat: A pond over 3 km^2. in the surroundings of Beshalma village. We investigated the bank on the opposite side of the village. The top of the reservoir – swamped bank with numerous shoals. 40% of vegetation is presented by *Carex sp*., 40 % - *Phragmites australis*, 20 % - other vegetation. On the bank of this pond current greenhouse agriculture for the cultivation of tomato and cucumber exist. Here there is also storage of pesticides on this territory.

Currently greenhouse agriculture is situated on the territory of 1 hectare, but there is potential for the expansion of up to 5 hectares.

Figure 1: Sample site 1.

In *Carex* vegetation four species of dragonflies were recorded:

- *Ischnura pumilio.* Very numerous, among them young ♀♀ «aurantiaca»
- *Ischnura elegans.* Less numerous then *I. pumilio*.
- *Sympetrum meridionale.* 1 ♀.
- *Lestes macrostigma.* 6 tandems. 2 single ♂♂ and 1 ♀.

Sample site 2

Date of survey: 29.06.2009.

Geographic coordinates: N 46°51'55.5" E 028°38'37.7 (158 m a.s.l.)

Locality: Between Bardar and Kotovsk.

Habitat: Slow-flowing stream of 3-4 m width, in swamped ravine. *Phragmites, Scirpus, Carex*, various grass vegetation, *Salix, Equisetum.*

Figure 2: Sample site 2.

Recorded Odonata species:

- *Platycnemis pennipes*. 4 ♂♂, 1 ♀
- *Ischnura pumilio*. 1 ♂.
- *Coenagrion scitulum*. 1 ♀.
- *Coenagrion ornatum*. 2 ♂♂
- *Libellula depressa*. Several ♂♂.

Sample site 3

Date of survey: 29.06.2009.

Geographic coordinates: N 46°51'52.7" E 028°38'48.8" (157 m a.s.l.)

Locality: Between Bardar and Kotovsk.

Habitat: The pond is surrounded by 2-3 streams (see Sample site 2). The area of the pond about 2 hectares. Vegetation: *Potamogeton crispus* L. On one bank mostly grass vegetation is represented, on the other – a 4-5 meters wide belt of *Typha latifolia*.

Rana ridibunda is very numerous for this pond, *Carassius auratus* and *Natrix tesselata* are abundant.

Recorded Odonata species:

- *Coenagrion puella*. 2 ♂♂
- *Coenagrion scitulum*. 1 ♂, 1 ♀
- *Coenagrion ornatum*. 1 ♂, 1 ♀.
- *Enallagma cyathigerum.* 2 ♂♂.
- *Platycnemis pennipes*. 1 ♂
- *Ischnura elegans*. 1 ♂
- *Ischnura pumilio*. 1 tandem, 8 ♂♂, ♀ „aurantiaca" occurs
- *Anax imperator.* Several specimens
- *Orthetrum albistylum*. Over 30 single ♂♂, 1 teneral ♀, 1 tandem.
- *Libellula depressa*. 3 ♂♂, 2 ♀♀ (oviposition)
- *Erythromma viridulum*. Numerous.

Sample site 4

Date of survey: 29.06.2009.

Geographic coordinates: N 47°21'23.3" E 028°01'59.8" (159 m a.s.l.)

Locality: Between Kornesty and Comeşti, surroundings of Ungheni.

Habitat: Natural pond, originated from stream. The water is clear and flowing in the pond. Streams are originated in the forest. Vegetation: *Phragmites* at the peak of the pond, mostly grass vegetation on its banks (cornfields, clover, rarely *Carex*, T*ypha angustifolia*. Along the dam – *Typha latifolia, Butomus umbellatus*.

The pond is characterized by intensive cultivation of herbivorous fish species and crayfish *Astacus astacus*. Livestock comes to this pond for watering. Bank is untouched, there is no excessive anthropogenic pressures.

Recorded Odonata species:

- *Ischnura elegans.* Over 20 single specimens and tandems.
- *Erythromma viridulum*. Numerous.
- *Anax imperator.* 3 ♂.
- *Orthetrum albistylum.* Numerous.
- *Ischnura pumilio.* 1 ♂.

Sample site 5

Date of survey: 29.06.2009.

Geographic coordinates: N 47°21'23.3" E 028°01'59.8" (159 m a.s.l.)

Locality: Between Kornesty and Comeşti, surroundings of Ungheni.

Habitat: This Sample site is situated near the Sample site 4. Small pond of anthropogenic origin (excavated stream). Along the banks - *Typha latifolia* and *Scirpus lacustris*. In the pond – *Potamogeton crispus* L.

Recorded Odonata species:

- *Anax imperator*. 3 ♂♂.
- *Orthetrum albistylum*. 2 ♂♂
- *Coenagrion puella*. 1 ♂

Sample site 6

Date of survey: 30.06.2009.

Geographic coordinates: N 47°21'49.2" E 027°51'01.9" (94 m a.s.l.)

Locality: Surroundings of Pyrlitsa.

Natural pond of 120-150 ha with a very rich avifauna.

Habitat: The ratio of open water and aquatic vegetation is 1:1 for this pond.

Bufo viridis (2-3 days juvenile specimens) was very numerous on the bank of this pond, ca. 1 specimen per 10 m^2.

Bank are almost not transformed, represented by virgin sites and used as pasture for sheep with some trees. 90 % of vegetation is represented by *Phragmites*. *Carex*, *Scirpus* and also *Typha* occurs. Submerged vegetation in the pond - *Batrachium aquatile* (L.) Dumort.

Figure 3: Sample site 6 (overview).

Figure 4: Sample site 6

Recorded Odonata species:

- *Ischnura pumilio*. Numerous. ♀♀ "aurantiaca" occur.
- *Ischnura elegans.* Less numerous, then *I. pumilio.*
- *Sympecma fusca*. 2 ♂♂.
- *Lestes sponsa*. 1 ♂.
- *Lestes macrostigma.* 1 ♀.
- *Sympetrum meridionale*. Common at this sample site.
- *Sympetrum striolatum*. Numerous.

Sample site 7

Date of survey: 30.06.2009.

Geographic coordinates: N 47°30'09.5" E 027°46'41.9" (60 m a.s.l.)

Locality: Surroundings of Făleşti.

Habitat: Fish pond with regulated hydroregime and intensive fish farming. The banks of this pond are open soils, no forest is absent here. The bank vegetation concistsed of *Typha angustifolia*, *Scirpus lacustris* and *Phragmites communis*.

Recorded Odonata species:

- *Lestes macrostigma*. 1 tandem, 2 single ♀♀.
- *Sympecma fusca*. 1 ♀.
- *Sympetrum meridionale.* 3 ♀♀, 2 ♂♂.
- *Sympetrum striolatum*. 1 ♀.
- *Ischnura pumilio*. Common.
- *Ischnura elegans*. Common.
- *Orthetrum cancellatum*. 3 ♂.
- *Orthetrum albistylum.* Several tandems, female oviposition and over 10 single specimens.

Sample site 8

Date of survey: 30.06.2009.

Geographic coordinates: N 47°37'23.3" E 027°25'19.6" (54 m a.s.l.)

Locality: Surroundings of Glodeni.

Habitat: Stream originated from pond and separated from the road with the pond. The stream has rocky bottom.

Recorded Odonata species:

- *Orthetrum brunneum*. Common in the part of river with the swift flow.

On the part of the river with slower velocity:

- *Ischnura elegans*. Common.
- *Ischnura pumilio*. Common.
- *Erythromma viridulum*. Common.
- *Orthetrum albistylum*. 1 ♂.

Sample site 9

Date of survey: 30.06.2009.

Geographic coordinates: N 47°37'23.3" E 027°25'19.6" (54 m a.s.l.)

Locality: Surroundings of Glodeni.

Habitat: Pond over 200 ha with stagnant water and rich submerged vegetation and swamped banks.

Recorded Odonata species:

- *Ischnura elegans*. Common.
- *Erythromma viridulum*. Numerous.
- *Orthetrum albistylum*. ♂♂, numerous.

Sample site 10

Date of survey: 01.07.2009.

Geographic coordinates: N 47°38'12.1" E 027°22'20.2" (61 m a.s.l.)

Locality: Surroundings of Glodeni; Nature reserve: Pădurea Domnească (cantonul N 8)

Habitat: At the edge of a forest.

Recorded Odonata species:

- *Orthetrum cancellatum.* Numerous.
- *Sympetrum meridionale*. Common.
- *Lestes barbarus.* Common.

Sample site 11

Date of survey: 01.07.2009.

Geographic coordinates: N 47°38'06.7" E 027°22'36.0" (60 m a.s.l.)

Locality: Surroundings of Glodeni; Nature reserve: Pădurea Domnească (cantonul N 8)

Habitat: Old riverbed (30-40 m width). Among vegetation, *Typha latifolia* is abundant, on the other part of open water there are *Carex* vegetation and rare *Scirpus lacustris*. Also *Potamogeton*, *Myriophyllum* and *Ceratophyllum* occur in this Sample site.

Close to the old riverbed meadows with grass vegetation are adjoined.

Dragonflies in *Carex* vegetation:

- *Sympecma fusca.* Common. 1 ♂, 3 ♀♀.
- *Sympetrum meridionale*. Numerous
- *Sympetrum striolatum*. 1 ♀.
- *Sympetrum sanguineum*. 1 ♀, 1 ♂.
- *Ischnura elegans.* Common.
- *Ischnura pumilio.* Common.

Sample site 12

Date of survey: 01.07.2009.

Geographic coordinates: N 47°38'17.4" E 027°22'08.7" (60 m a.s.l.)

Locality: Surroundings of Glodeni; Nature reserve: Pădurea Domnească (cantonul N 8)

Habitat: At the border of forest and lake.

Recorded Odonata species:

- *Aeshna affinis*. 1 ♂.
- *Platycnemis pennipes*. 1 ♂.

Sample site 13

Date of survey: 01.07.2009.

Geographic coordinates: N 47°38'07.4" E 027°22'02.6" (60 m a.s.l.)

Locality: Surroundings of Glodeni; Nature reserve: Pădurea Domnească (cantonul N 8)

Habitat: Shallow lake in the forest. The banks totally overgrown.

Figure 5: Sample site 13.

Recorded Odonata species:

- *Ischnura elegans.* Common.
- *Coenagrion puella.* Common.
- *Coenagrion pulchellum.* 1 ♂.
- *Orthetrum albistylum.* Common
- *Crocothemis erythraea.* 1 ♂.
- *Anax imperator*. 2 ♂.
- *Aeshna affinis.* 1 ♂.
- *Sympetrum sanguineum.* 1 ♂ in the forest near the lake.

Sample site 14

Date of survey: 02.07.2009.

Geographic coordinates: N 47°46'08.4" E 027°20'59.6" (68 m a.s.l.)

Locality: Surroundings of Glodeni.

Habitat: Stream of natural origin of a width of 2-3 m. On the bank of the stream there are outcrops of limestone. The vegetation in the stream consists of *Phragmites*, *Typha*, *Carex*. The ground is rocky and hard.

Recorded Odonata species:

- *Calopteryx splendens*. 1 ♂. Near the stream.
- *Platycnemis pennipes*. Over 10 specimens at the meadow in *Scirpus* and *Carex* vegetation.
- *Sympetrum meridionale*. 1 ♀, the same habitat as *P. pennipes*.
- *Anax imperator*. 1 ♂ at dry field was “hunting” for small insects.

Sample site 15

Date of survey: 02.07.2009.

Geographic coordinates: N 47°47'45.3" E 027°20'09.1" (83 m a.s.l.)

Locality: Surroundings of Glodeni.

Habitat: Small fast river, with rocky bottom.

Figure 6: Sample site 15.

Recorded Odonata species:

- *Orthetrum brunneum*. 2 ♂♂.
- *Platycnemis pennipes*. 1 ♂.

Sample site 16

Date of survey: 02.07.2009.

Geographic coordinates: N 47°48'40.0" E 027°21'09.3" (79 m a.s.l.)

Locality: Surroundings of Glodeni.

Habitat: The head of the same river (see sample site 15).

Recorded Odonata species:

- *Orthetrum brunneum*. Several ♂♂.
- *Ischnura pumilio*. 1 ♀.

Figure 7: Sample site 16.

Sample site 17

Date of survey: 02.07.2009.

Geographic coordinates: N 47°51'58.7" E 027°17'18.7" (177 m a.s.l.)

Locality: Surroundings of Galashany.

Habitat: An intensive fish farming pond area of about 50 hectares with *Phragmites* vegetation.

Recorded Odonata species:

- *Orthetrum albistylum*. 3 ♂♂, 1 ♀
- *Ischnura elegans*. Several specimens.
- *Platycnemis pennipes*. Several specimens.

Sample site 18

Date of survey: 02.07.2009.

Geographic coordinates: N 47°51'58.7" E 027°17'18.7" (177 m a.s.l.)

Locality: Surroundings of Galashany.

Habitat: Outflow of the pond (sample site 17), soon becoming very natural. The width of the stream is about 3 m. Vegetation: cornfield, *Scirpus* and *Carex*.

The bank of the stream is over 0.5-0.7 m and steep. The ground is of clay.

Recorded Odonata species:

- *Calopteryx splendens*. 1 ♂.
- *Ischnura elegans*. Several specimens.
- *Platycnemis pennipes*. Several specimens.
- *Orthetrum albistylum*. Several specimens, ♂♂.

Sample site 19

Date of survey: 02.07.2009.

Geographic coordinates: N 47°56'46.3" E 027°26'48.2" (140 m a.s.l.)

Locality: Surroundings of Ryshkany.

Habitat: Artificial pond with stagnant water, about 5 hectares, with *Myriophyllum*, *Ceratophyllum*, *Scirpus* and *Typha*. The banks of the pond were intensely grazed.

Recorded Odonata species:

- *Erythromma viridulum*. Numerous.
- *Orthetrum albistylum*. Common.
- *Ischnura elegans*. Common

Sample site 20

Date of survey: 02.07.2009.

Geographic coordinates: N 47°37'40.9" E 027°51'47.4" (124 m a.s.l.)

Locality: Surroundings of Glinzheny.

Habitat: Natural pond (area of approx. 5 ha), surrounded by slopes with bare soil. The bank vegetation is grass-like and includes *Phragmites* and *Carex*. The pond is in good condition, without excessive anthropogenic pressures. On one side of the pond there is an abandoned.

Recorded Odonata species:

- *Ischnura elegans*. Numerous.
- *Ischnura pumilio*. Numerous.
- *Orthetrum albistylum*. Common.
- *Libellula depressa*. 3 ♂♂.
- *Anax parthenope*. 1 ♂, 1 ♀ (exuvium)

Sample site 21

Date of survey: 03.07.2009.

Geographic coordinates: N 47°13'12.9" E 028°46'21.8" (82 m a.s.l.)

Locality: Surroundings of Orhei

Habitat: Natural stream (of 0.5 m width and about 10 cm depth) flowing into the river Reut (Dniester tributary). The slope on 50% consist of forest. Vegetation along the stream: cornfields *Scirpus*, *Carex*.

Recorded Odonata species:

- *Calopteryx splendens*. 5 ♂♂, 3 ♀♀
- *Platycnemis pennipes*. Several specimens.

Sample site 22

Date of survey: 03.07.2009.

Geographic coordinates: N 46°58'26.0" E 028°28'21.5" (166 m a.s.l.)

Locality: Kogil'nik river around Chuckuleny.

Habitat: The rivers bed was modified in a channel. The natural vegetation on

surrounding slopes was restored which prevents erosive processes. Among the vegetation along the river there were willows, *Salix* (rather densely), *Phragmites, Scirpus* and *Carex* occur. The ground was muddy, the width of the river over 1 m. River appears natural condition.

Figure 8: Sample site 22.

Recorded Odonata species:

- *Calopteryx splendens*. 2 ♂♂
- *Platycnemis pennipes.* Numerous
- *Orthetrum brunneum*. 5 ♂♂

Sample site 23

Date of survey: 03.07.2009.

Geographic coordinates: N 46°43'40.3" E 028°30'50.8" (87 m a.s.l.)

Locality: Sarata River around Sarata-Galbena.

Habitat: The river is canalised but natural vegetation was restored. The velocity of the river is intermediate.

Figure 9: Sample site 23.

Recorded Odonata species:

- *Platycnemis pennipes*. Common.
- *Ischnura elegans*. Common.
- *Orthetrum brunneum*. Common.
- *Coenagrion ornatum*. 1 ♂.

Sample site 24

Date of survey: 03.07.2009.

Geographic coordinates: N 46°42'32.0" E 028°30'42.3" (82 m a.s.l.)

Locality: Pond around Sarata-Galbena.

Habitat: The pond is about 100 hectares with minimal anthropogenic impact. Partially well-developed vegetation: cornfields, *Carex*, *Scirpus*, *Typha*.

Slopes are of bre soil, steep and show signs of agricultural use.

Recorded Odonata species:

- *Ischnura elegans*. Numerous.
- *Orthetrum albistylum*. 2 ♂♂.
- *Lestes barbarus*. Several specimens.
- *Sympetrum meridionale*. 1 specimen.

Sample site 25

Date of survey: 03.07.2009.

Geographic coordinates: N 46°25'15.8" E 028°15'05.9" (21 m a.s.l.)

Ganaseni-Nou, surroundings of Leova.

Habitat: Steep bank of Prut River.

Recorded Odonata species:

- *Calopteryx splendens.* Common.
- *Platycnemis pennipes*. Common.

Sample site 26

Date of survey: 04.07.2009.

Geographic coordinates: N 46°36'28.8" E 029°18'52.1" (15 m a.s.l.)

Locality: Botna River between Salkutsa and Zaim, surroundings of Căuşeni.

Habitat: The bed of the Botna was canalised. The width of the river about 2 m. The velocity in the river is intermediate, the water is clear. The bottom of the river is the mixture of clay and send.

Bank with *Phragmites* and *Carex* vegetation. Rarely trees and bushes on the river bank and dry steep grass vegetation.

Figure 10: Sample site 26.

Recorded Odonata species:

- *Ischnura elegans.* Common.
- *Orthetrum brunneum*. ♂♂ are very numerous, 1 tandem and 1 single ♀. 10-15 specimens per 100 m shore.
- *Platycnemis pennipes*. Several specimens.

Sample site 27

Date of survey: 04.08.2005

Geographic coordinates: N 47°41'52.08" E 28°58'30.52" (15 m a.s.l.)

Locality: Sakharna, surroundings of Rezina.

Habitat: The area of the middle part of the Dniester river and streams.

Recorded Odonata species:

- *Calopteryx splendens*. Several ♂♂.
- *Orthetrum albistylum*. Single ♂♂, 1 ♀ (oviposition)
- *Coenagrion puella*. 2 ♂♂.
- *Ischnura elegans*. Common.
- *Erythromma viridulum*. Common.
- *Sympetrum meridionale*. Common.
- Sympetrum sanguineum 5 ♂♂.
- *Platycnemis pennipes*. Numerous.
- *Lestes barbarus*. 1 ♀.

Current checklist of the dragonflies of Moldova compiled from the literature, personal observation and oral communications

***Calopteryx splendens* (Figure 14)**

Andreev, 1998: Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22".

Osenimskiy, 2006: Iagorlyk reserve (Pridnestrovian Moldavian Republic, also known as Transnistria), N 47°22'15.03" E 029°10'03.02".

***Lestes barbarus* (Figure 15)**

Andreev, 1998: 1) Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22"; 2) Răscăeți, Dniester, N 46°34'49.37" E 029°46'45.53"

***Lestes parvidens ?* (Figure 17)**

Andreev, 1998: Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22".

Mentioned as *L. viridis* in Andreev, 1998. May be confused with *Lestes parvidens* which occurs in the lower Dniester river on Ukrainian side (Dyatlova, 2006).

***Lestes sponsa* (Figure 18)**

Bezvali, 1932: 1) Chişinău, N 47°01'15.29" E 028°48'54.42"

***Sympecma fusca* (Figure 19)**

Bezvali, 1932: 1) Căpriana, N 47°7'3" E 028°30'16", 2) Leova, N 46°29'06.04" E 028°14'31.48", 3) Chişinău, N 47°01'15.29" E 028°48'54.42"; 3) Surroundings of Pyrlitsa, 2 ♂♂, 30.06.2009, N 47°21'49.2" E 027°51'01.9"; 4) Surroundings of Falesti, 1 ♀, 30.06.2009, N 47°30'09.5" E 027°46'41.9".

***Platycnemis pennipes* (Figure 20)**

Andreev, 1998: 1) Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22"; 2) Răscăeți, Dniester, N 46°34'49.37" E 029°46'45.53"

Osenimskiy, 2006: Iagorlyk reserve (Pridnestrovian Moldavian Republic, also known as Transnistria), N 47°22'15.03" E 029°10'03.02".

***Coenagrion puella* (Figure 22)**

Brauner, 1910: 1) Ciutuleşti, 15.V.1907, ♂, 47° 45‘ 41‘‘ N, 28° 23‘ 44‘‘ E; 2) ♂♂ (numerous) Zagorna, 2.VI.1907, N 47°47'48" E 028°33'10"; 3) ♂♂ (numerous) Zagorna, 6.VI.1907, N 47°47'48" E 028°33'10"

Andreev, 1998: Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22".

***Coenagrion pulchellum* (Figure 23)**

Brauner, 1910: 1) Ciutuleşti, 09.V.1907, 1 , 2 ♂♂, 47° 45‘ 41‘‘ N, 28° 23‘ 44‘‘ E

***Enallagma cyathigerum* (Figure 25)**

Brauner, 1910: 1) Ciutuleşti, 15.V.1907, female, N 47° 45‘ 41‘‘, E 28° 23‘ 44‘‘.

***Erythromma lindenii* (Figure 26)**

Andreev, 1998

Erythromma lindenii was recorded by V.V. Derzhansky (pers. comm.) (Andreev, 1998) but the exact locality not provided.

***Erythromma viridulum* (Figure 27)**

Andreev, 1998: 1) Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22"; 2) Kopanka, Dniester, N 46°40'31.83" E 029°36'20.60".

***Ischnura elegans* (Figure 28)**

Andreev, 1998: 1) Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22"; 2) Kopanka, Dniester, N 46°40'31.83" E 029°36'20.60".

Osenimskiy, 2006: Iagorlyk reserve (Pridnestrovian Moldavian Republic, also known as Transnistria), N 47°22'15.03" E 029°10'03.02".

***Ischnura pumilio* (Figure 29)**

Andreev, 1998: Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22".

***Nehalennia speciosa* (Figure 30)**

Bezvali, 1932: 1) Leova , N 46°29’06.04’’ E 028°14’31.48’’.

According to Bernard & Wildermuth (2005) the record of *Nehalennia speciosa* is probably doubtful.

***Aeshna affinis* (Figure 31)**

Brauner, 1910: 1) Kornesty, 22.VI.1907, N 47°21'22" E 028°00'30"; 2) Ivancha, Orhei region. Numerous emergence. ♀♀/♂♂. 29.VI.1907, N 47°17'05" E 028°51'25"

Andreev, 1998: Kopanka, Dniester, N 46°40'31.83" E 029°36'20.60".

Aeshna juncea (Figure 32)

Osenimskiy, 2006: Iagorlyk reserve (Pridnestrovian Moldavian Republic, also known as Transnistria), N 47°22'15.03" E 029°10'03.02".

For *Aeshna juncea* record in Iagorlyk reserve confirmation is needed.

Aeshna isosceles (Figure 33)

Brauner, 1910: 1) Ciutuleşti, 15.V.1907, ♀, N 47° 45‘ 41‘‘, E 28° 23‘ 44‘‘;

2) Zagorna, 15.V.1907, N 47°47'48" E 028°33'10".

Aeshna mixta (Figure 34)

Bezvali, 1932: 1) Chişinău, N 47°01'15.29" E 028°48'54.42".

Andreev, 1998: 1) Răscăeți, Dniester, N 46°34'49.37" E 029°46'45.53"; 2) Kopanka, Dniester, N 46°40'31.83" E 029°36'20.60".

Anax imperator (Figure 35)

Bezvali, 1932: 1) Chişinău, N 47°01'15.29" E 028°48'54.42".

Brauner, 1910: 1) Zagorna, Soroca region, 6.VI.1907, N 47°47'48" E 028°33'10".

Anax parthenope (Figure 36)

Bezvali, 1932: 1) Chişinău, N 47°01'15.29" E 028°48'54.42".

Brauner, 1910: 1) Zagorna, Soroca region, 6.VI.1907, N 47°47'48" E 028°33'10".

Somatochlora flavomaculata (Figure 37)

Brauner, 1910: 1) Zagorna, Soroca region, 6.VI.1907, N 47°47'48" E 028°33'10".

Crocothemis erythraea (Figure 38)

Andreev, 1998: 1) Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22"; 2) Kopanka, Dniester, N 46°40'31.83" E 029°36'20.60".

***Leucorrhinia pectoralis* (Figure 39)**

A.V. Andreev, pers. comm.: 1) On the border of the forest and swampy meander, downstream from the Chobruchi village (Raionul Stefan-Voda), 24.V.2009, N 46°35'17.73" E 029°45'24.85".

***Libellula depressa* (Figure 40)**

Brauner, 1910: 1) Ciutuleşti, 15.V.1907, 2♂♂, N 47° 45‘ 41‘‘, E 28° 23‘ 44‘‘; 2) Zagorna, Soroca region, 6.VI.1907, N 47°47'48" E 028°33'10".

Andreev, 1998: Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22".

***Libellula quadrimaculata* (Figure 41)**

Brauner, 1910: 1) Zagorna, Soroca region, 6.VI.1907, N 47°47'48" E 028°33'10".

***Orthetrum albistylum* (Figure 42)**

Andreev, 1998: Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22".

***Orthetrum cancellatum* (Figure 44)**

Brauner, 1910: Ciutuleşti, Soroca region, 15.V.1907, N 47°45'41" E 028°23'44".

***Sympetrum depressiusculum* (Figure 45)**

Bezvali, 1932: 1) Chişinău, N 47°01'15.29" E 028°48'54.42"

Andreev, 1998: 1) Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22"; 2) Răscăeți, Dniester, N 46°34'49.37" E 029°46'45.53"; 3) Kopanka, Dniester, N 46°40'31.83" E 029°36'20.60".

***Sympetrum flaveolum* (Figure 46)**

Bezvali, 1932: 1) Căpriana, N 47°7'3" E 028°30'16"; 2) Lapushna

N 46°53'36.19" E 028°24'39.37".

Brauner, 1910: 1) Zagorna, Soroca region, 6.VI.1907, N 47°47'48" E 028°33'10".

Andreev, 1998: Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22".

***Sympetrum meridionale* (Figure 47)**

Bezvali, 1932: 1) Căpriana, N 47°7'3" E 028°30'16"; 2) Lapushna

N 46°53'36.19" E 028°24'39.37".

Andreev, 1998: 1) Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22"; 2) Răscăeți, Dniester, N 46°34'49.37" E 029°46'45.53"; 3) Kopanka, Dniester, N 46°40'31.83" E 029°36'20.60".

***Sympetrum sanguineum* (Figure 48)**

Artobolevsky, 1917: 1) с. Чобручи, Аккерманского у., 14-19.VI.1917,

N 46°35'59.43" E 029°43'18.16".

Andreev, 1998: Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22".

***Sympetrum vulgatum* (Figure 49)**

Bezvali, 1932: 1) Căpriana, N 47°7'3" E 028°30'16"; 2) Lapushna, N 46°53'36.19" E 028°24'39.37".

Andreev, 1998: Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22".

Osenimskiy, 2006: Iagorlyk reserve (Pridnestrovian Moldavian Republic, also known as Transnistria), N 47°22'15.03" E 029°10'03.02".

***Sympetrum striolatum* (Figure 50)**

Andreev, 1998: 1) Talmaz, Dniester, N 46°39'13.57" E 029°39'59.22"; 2) Răscăeți, Dniester, N 46°34'49.37" E 029°46'45.53"; 3) Kopanka, Dniester, N 46°40'31.83" E 029°36'20.60".

Acknowlegements

Financial support was obtained by International Dragonfly Fund and the European Invertebrate Survey.

Author is grateful to scientific department of Low Dniester National Nature Park (Odessa-Mayaki, Ukraine) and to Alexei Andreev (BIOTICA Ecological Society, Moldova) for help and support.

References

Andreev, A. 1998. On Odonata fauna in Moldova and dragonflies of Talmaza's section of the Dniester river [O faune Odonata v Moldove i strekozakh Talmazskogo uchastka reki Dnestr] // Problemy sokhranenija bioraznoobrazija Srednego i Nizhnego Dnestra. Mat. Mezhdunar. Konf. Chisinau: BIOTICA, 6-7 nojabrja 1998. P. 14-16. (in Russian).

Artobolevsky, G. 1917. - K faune strekoz Bessarabii (To the fauna of Odonata of Bessarabia). - Materialy k poznaniyu fauny yugo-zapadnoy Rossii. (Materials to the knowledge of the fauna of Southwestern Russia) 2: 58. (in Russian with English subtitle).

Bernard, R. & H. Wildermuth 2005. Nehalennia speciosa (Charpentier, 1840) in Europe: a case of a vanishing relict (Zygoptera: Coenagrionidae). Odonatologica 34(4): 335-378.

Bezvali, V. 1932. - Odonata de Besarabie. - Bul. Muz. Nat. De Istorie Naturala din Chisinau 4: 68-69. (in Roumanian).

Brauner, A. 1910. - Materialy po entomologicheskoy faune Bessarabii. Zametka o strekozakh Bessarabii. (Materialien zu der entomologischen Fauna Bessarabiens. Odonata. Materials on entomologic fauna of Bessarabia. Notes on Odonata of Bessarabia). - Trudy Bessarabskogo Obschestva Estestvoispytateley (Transactions of Bessarabia Naturalists' Society) 2 (1): 3-5. (in Russian with German subtitle).

Cirdei, F. 1956. Contributii la cunosterea raspindirii subordinului Anisoptera (Ord. Odonata) in Moldova. Analele stintifice de Universitatii 'Al. I. Cuza' din Iasi N.S. 2(2): 203-210. (in Romanian).

Cîrdei, F.; Bulimar, F. 1961. Contributii la studiul larveor odonatelor (ord. Odonata) din Moldova. An. sti. Univ. Iasi (Sect. 2) 7: 343-350. (in Romanian).

Osenimskiy, B.I. 2006. [Short results of inventory of the fauna of the "Jagorlyk" reserve]. In: I.D. Trombitskiy, T.D. Sharapovskaya (Eds). Reserve "Jagorlyk". Eco-TIRAS, Tiraspol: 28-36. (in Russian).

Prunescu-Arion, El. 1969. Betrachtungen über die Benthosfauna des Moldova-Flusses. Hidrobioloia, Bucuresti 10: 187-190. (in German).

Appendix 1.

Figure 11: Map of Moldova (http://www.un.org/Depts/Cartographic/map/profile/moldova.pdf)

Appendix 2.

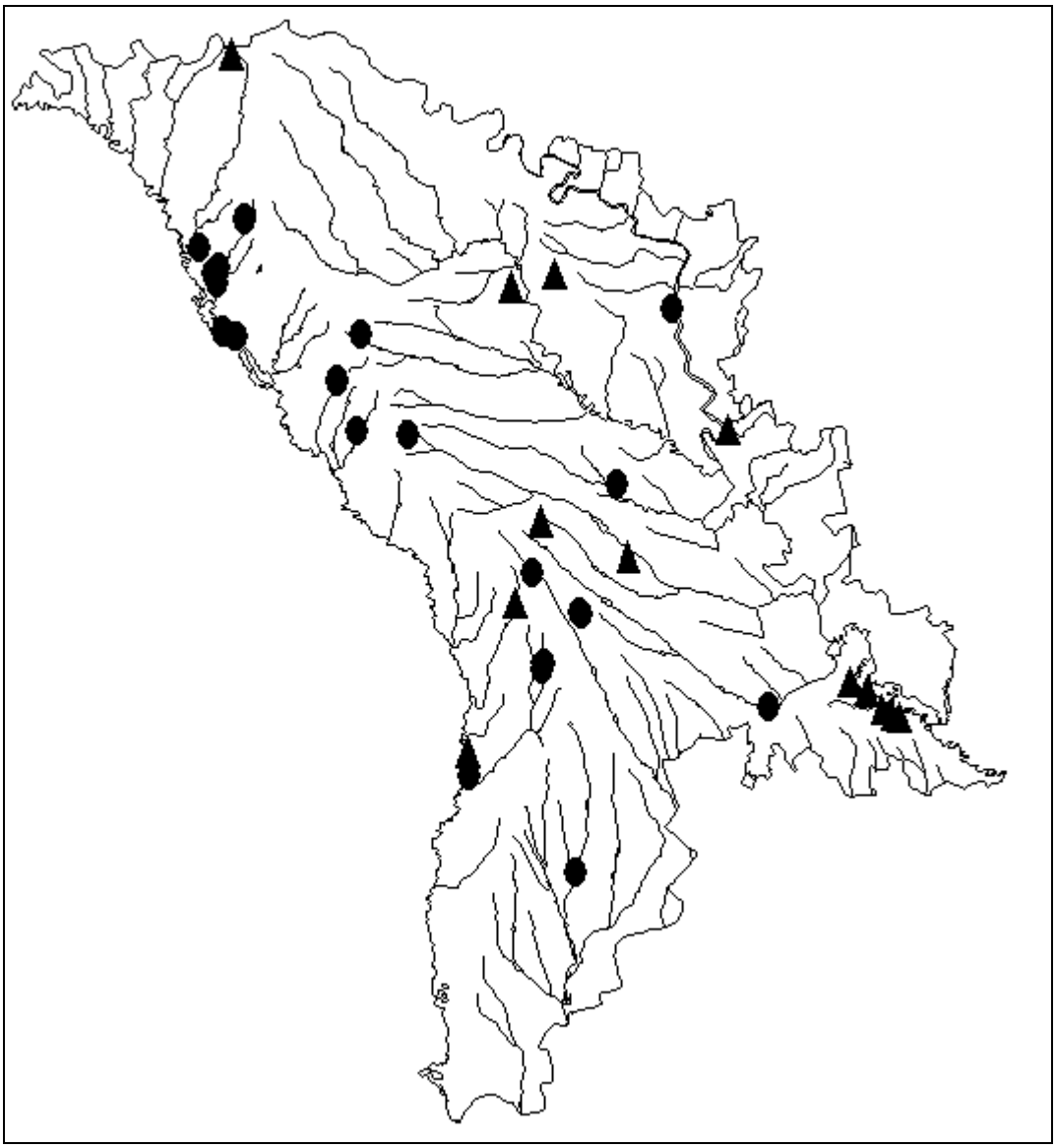


Figure 12: Map of localities in Moldova with records of Odonata by personal observations (E. Dyatlova, 2005, 2009) [●] and literature data (Artobolevsky, 1917; Bezvali, 1932; Brauner, 1910; Andreev, 1998; Osenimskiy, 2006) [▲].

Appendix 3.

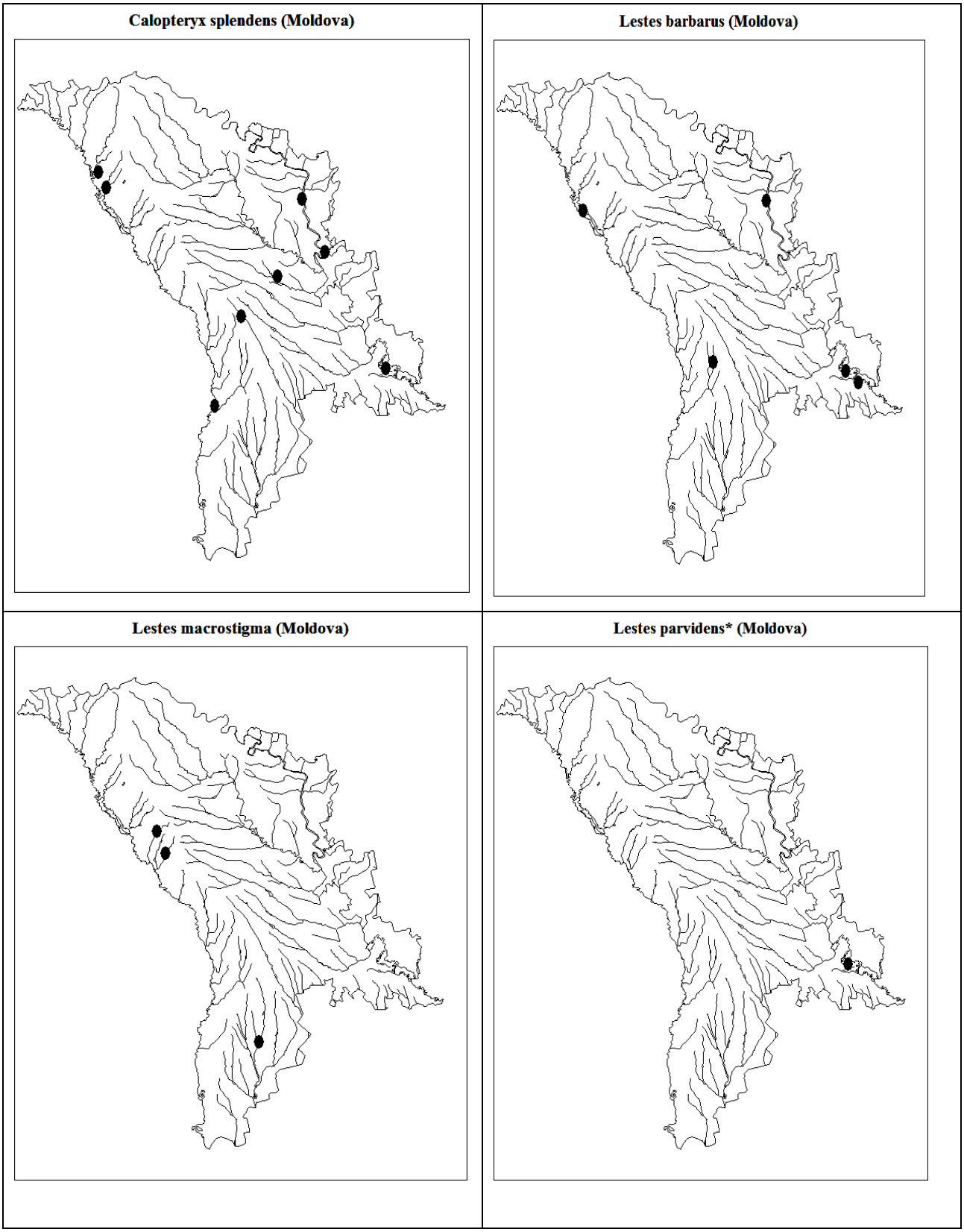
Tab. 1: Check list of dragonflies from Moldova by personal, literature data and oral communications. (1): Dyatlova, current research; (2): Artobolevsky, 1917; (3): Bezvali, 1932; (4); Brauner, 1910; (5): Andreev, 1998; (6): Andreev A.V., pers. comm.; (7): Osenimskiy, 2006

№	Species	Status	1	2	3	4	5	6	7
1	***Calopteryx splendens***	Present	+	-	-	-	+	-	+
2	***Lestes barbarus***	Present	+	-	-	-	+	-	-
3	***Lestes parvidens (viridis*** ?)	Present	-	-	-	-	+	-	-
4	***Lestes macrostigma***	Present	+	-	-	-	-	-	-
5	***Lestes sponsa***	Present	+	-	+	-	-	-	-
6	***Sympecma fusca***	Present	+	-	+	-	-	-	-
7	***Platycnemis pennipes***	Present	+	-	-	-	+	-	+
8	***Coenagrion ornatum***	Present	+	-	-	-	-	-	-
9	***Coenagrion puella***	Present	+	-	-	+	+	-	-
10	***Coenagrion pulchellum***	Present	+	-	-	+	-	-	-
11	***Coenagrion scitulum***	Present	+	-	-	-	-	-	-
12	***Enallagma cyathigerum***	Present	+	-	-	+	-	-	-
13	***Erythromma viridulum***	Present	+	-	-	-	+	-	-
14	***Erythromma lindenii***	The locality is not indicated	-	-	-	-	+[1]	-	-
15	***Ischnura elegans***	Present	+	-	-	-	+	-	+
16	***Ischnura pumilio***	Present	+	-	-	-	+	-	-
17	***Nehalennia speciosa***	Confirmation is needed	-	-	+	-	-	-	-
18	***Aeshna affinis***	Present	+	-	-	+	+	-	-
19	***Aeshna juncea***	Confirmation is needed	-	-	-	-	-	-	+
20	***Aeshna isosceles***	Present	-	-	-	+	-	-	-

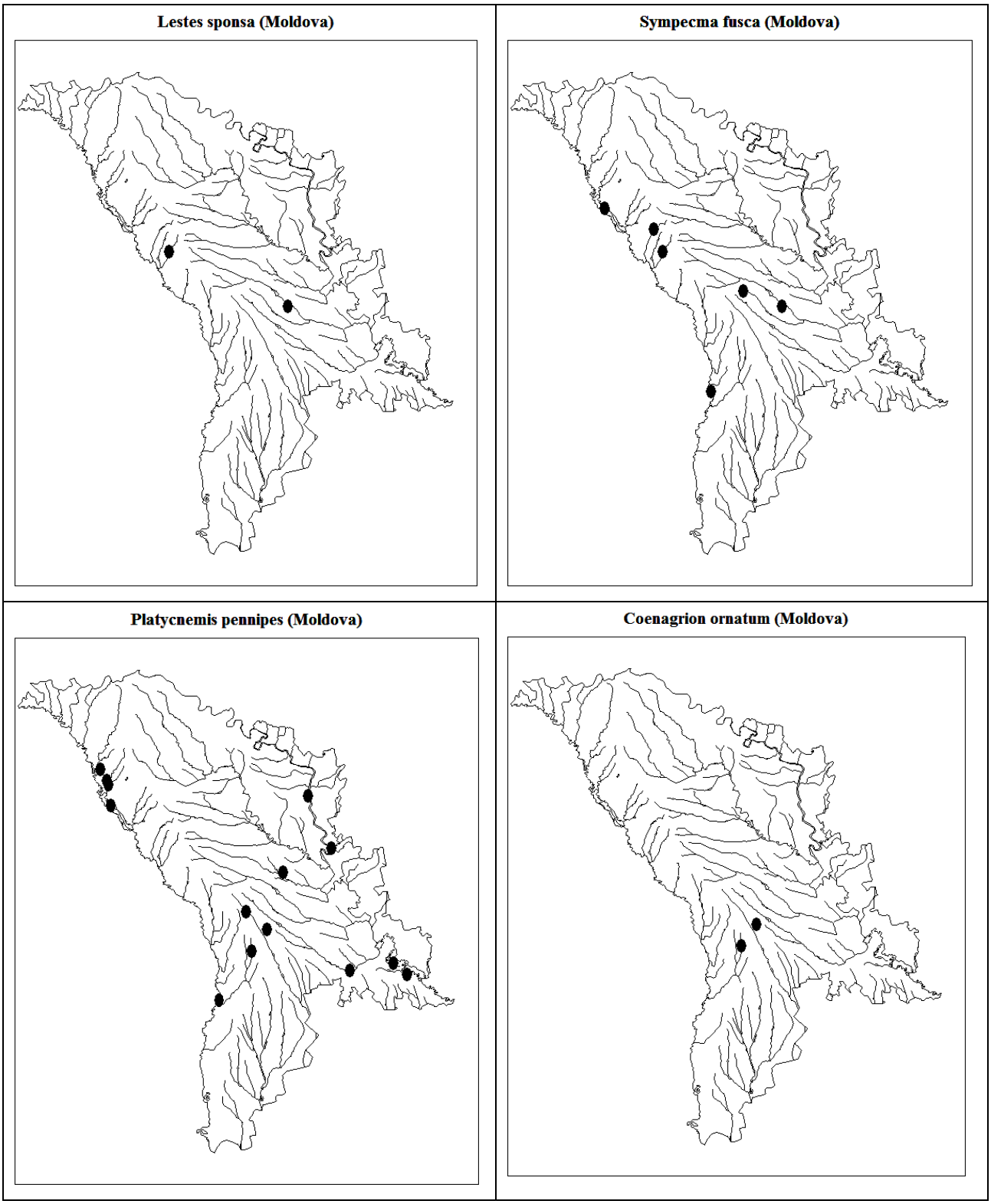
[1] Oral comm. by Derzhansky V.V.

№	Species	Status	1	2	3	4	5	6	7
21	***Aeshna mixta***	Present	-	-	+	-	+	-	-
22	***Anax imperator***	Present	+	-	+	+	-	-	-
23	***Anax parthenope***	Present	+	-	+	+	-	-	-
24	***Somatochlora flavomaculata***	Present	-	-	-	+	-	-	-
25	***Crocothemis erythraea***	Present	+	-	-	-	+	-	-
26	***Leucorrhinia pectoralis***	Present	-	-	-	-	-	+	-
27	***Libellula depressa***	Present	+	-	-	+	+	-	-
28	***Libellula quadrimaculata***	Present	-	-	-	+	-	-	-
29	***Orthetrum albistylum***	Present	+	-	-	-	+	-	-
30	***Orthetrum brunneum***	Present	+	-	-	-	-	-	-
31	***Orthetrum cancellatum***	Present	+	-	-	+	-	-	-
32	***Sympetrum meridionale***	Present	+	-	+	-	+	-	-
33	***Sympetrum flaveolum***	Present	-	-	+	+	+	-	-
34	***Sympetrum depressiusculum***	Present	-	-	+	-	+	-	-
35	***Sympetrum sanguineum***	Present	+	+	+	-	+	-	-
36	***Sympetrum vulgatum***	Present	-	-	+	-	+	-	+
37	***Sympetrum striolatum***	Present	+	-	-	-	+	-	-

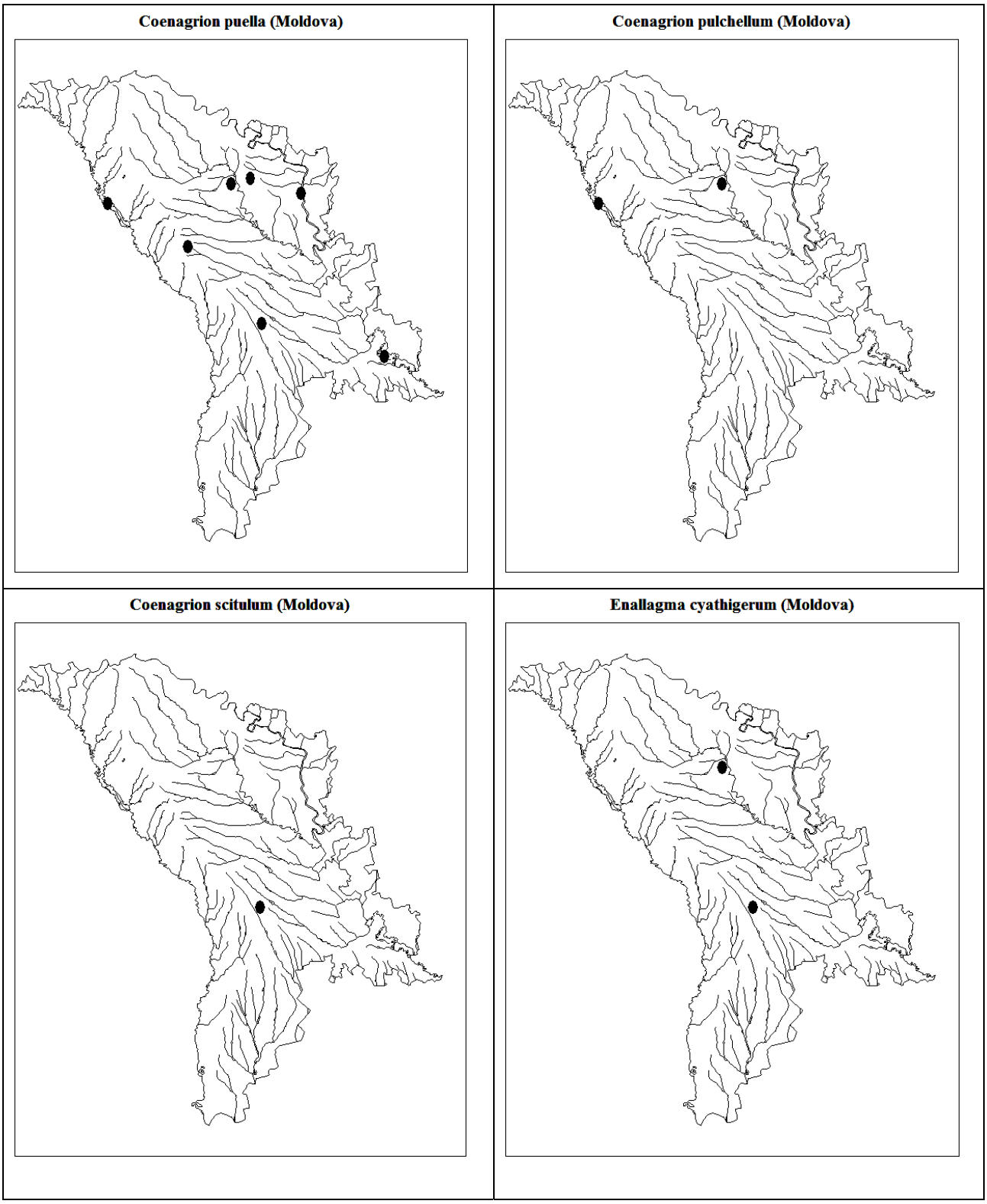
Appendix 4. Maps of species distribution in Moldova based on personal observation and literature data.



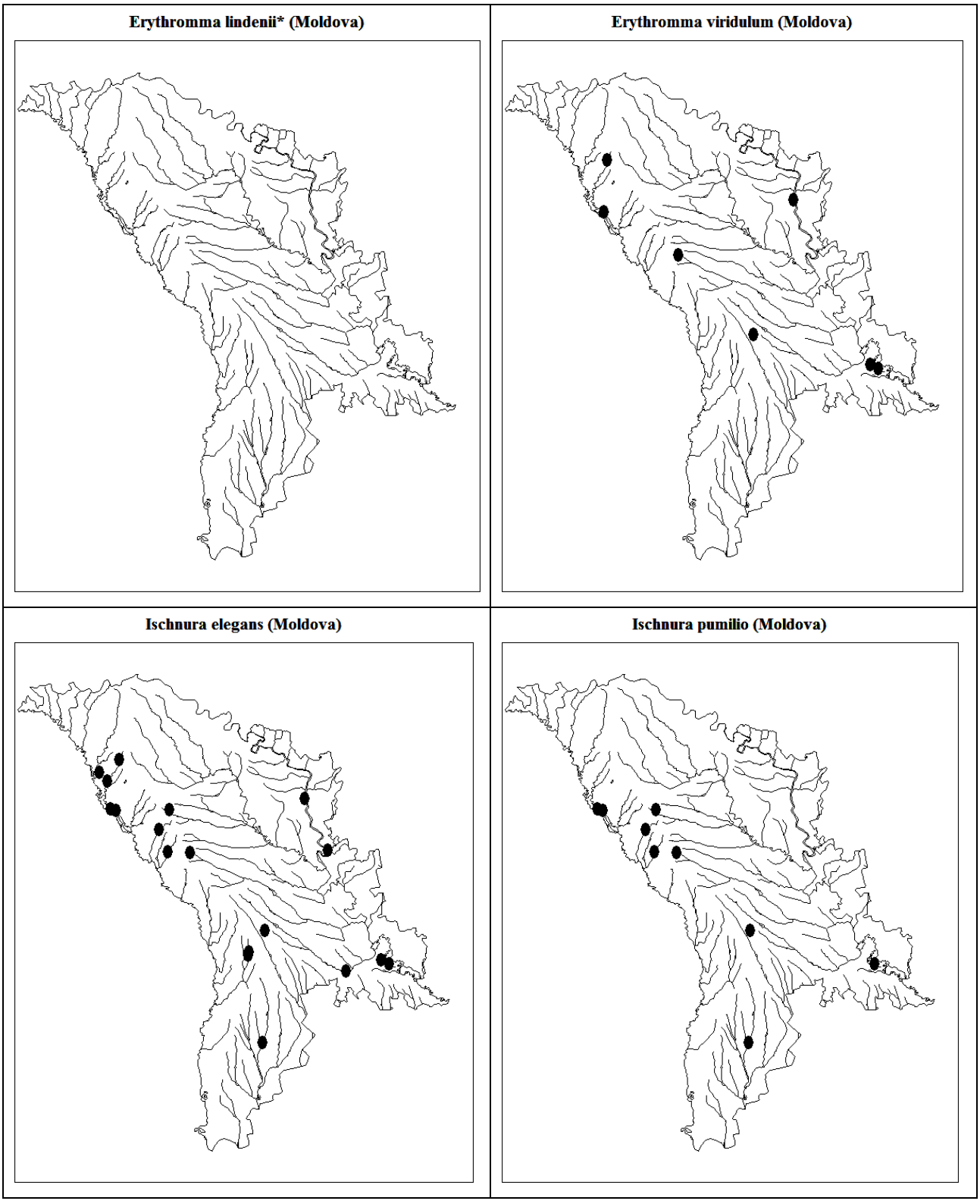
Figures 14 – 17: (more details see page 42)



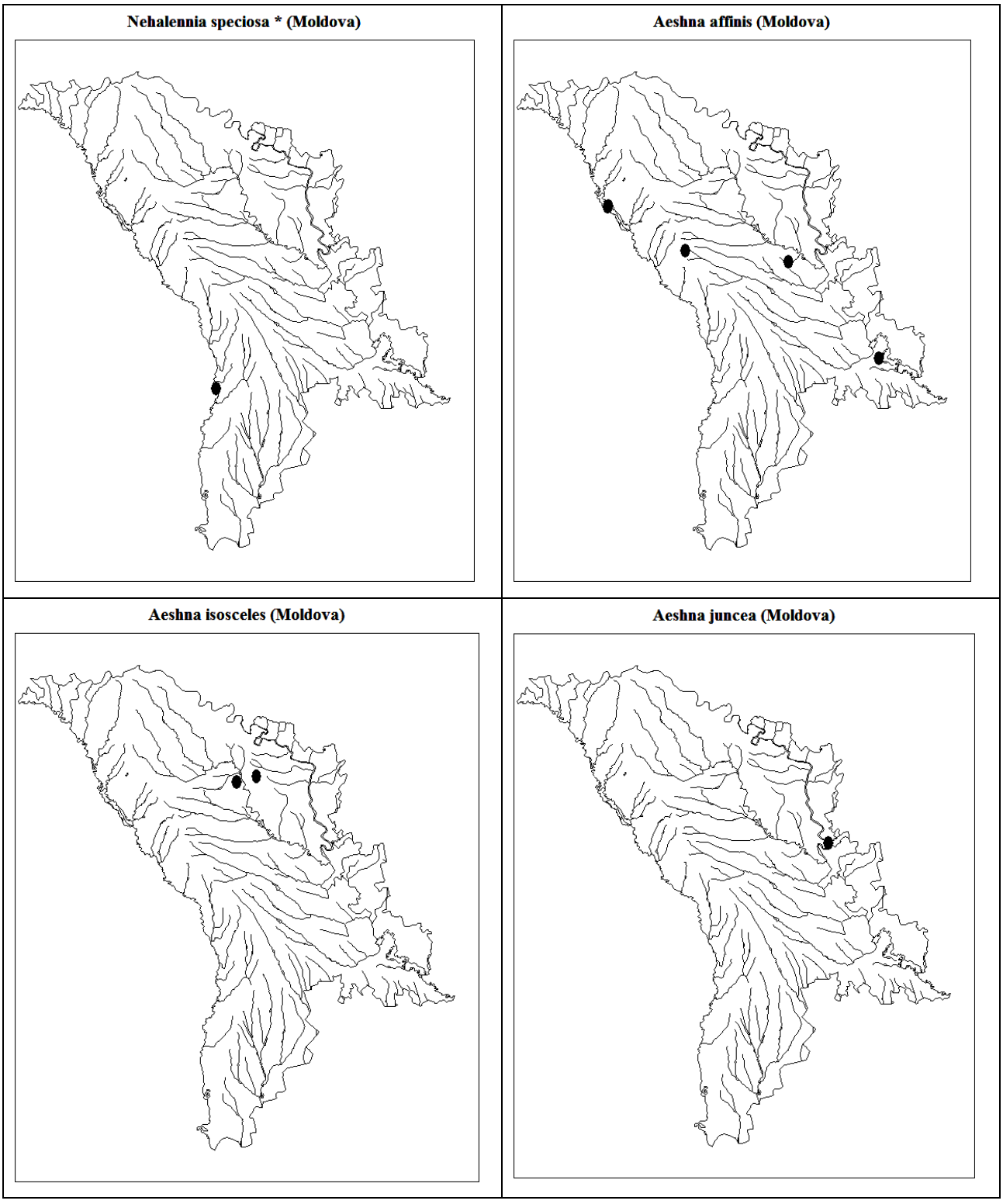
Figures 18 – 21: (more details see page 42)



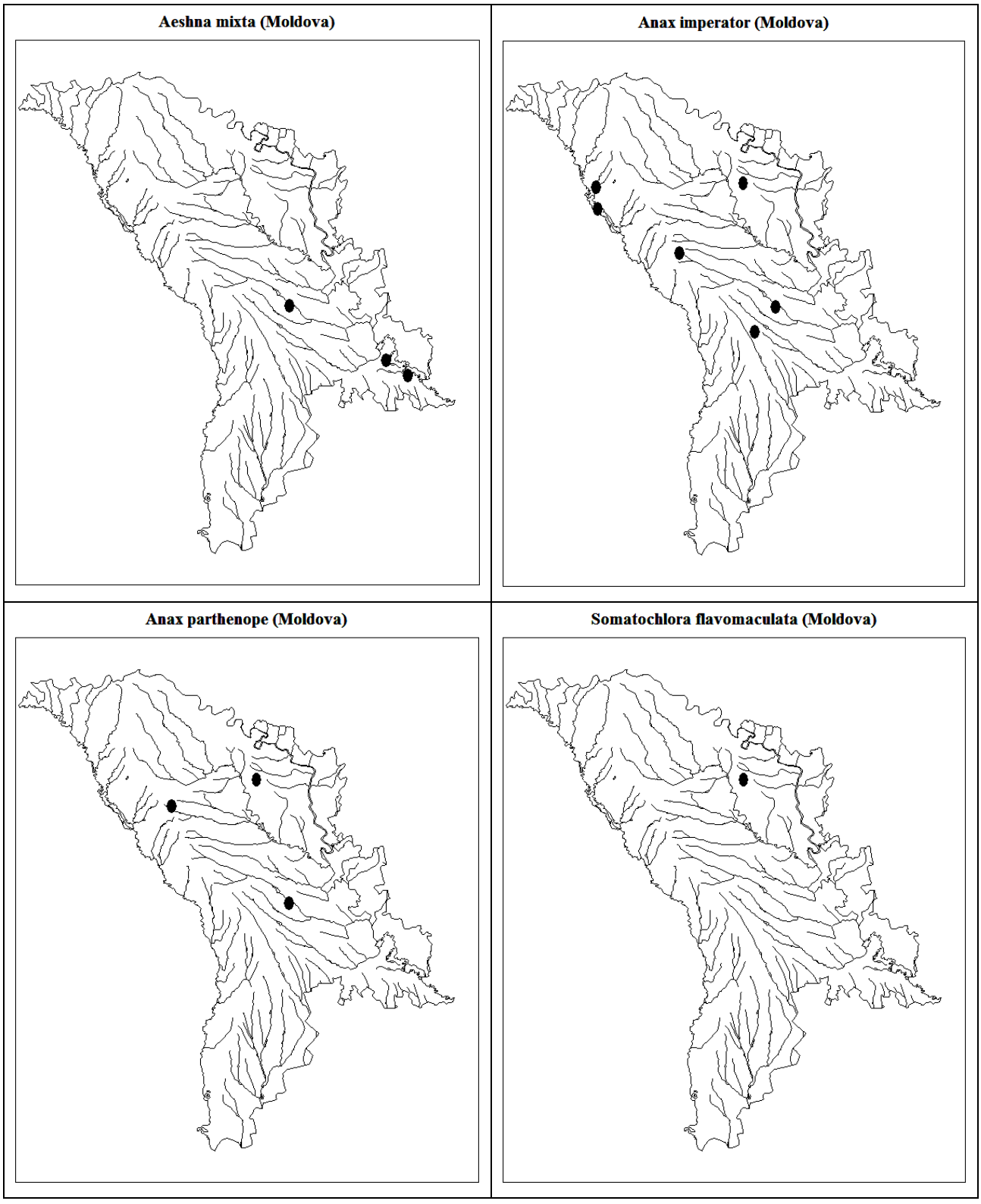
Figures 22 – 25: (more details see page 42)



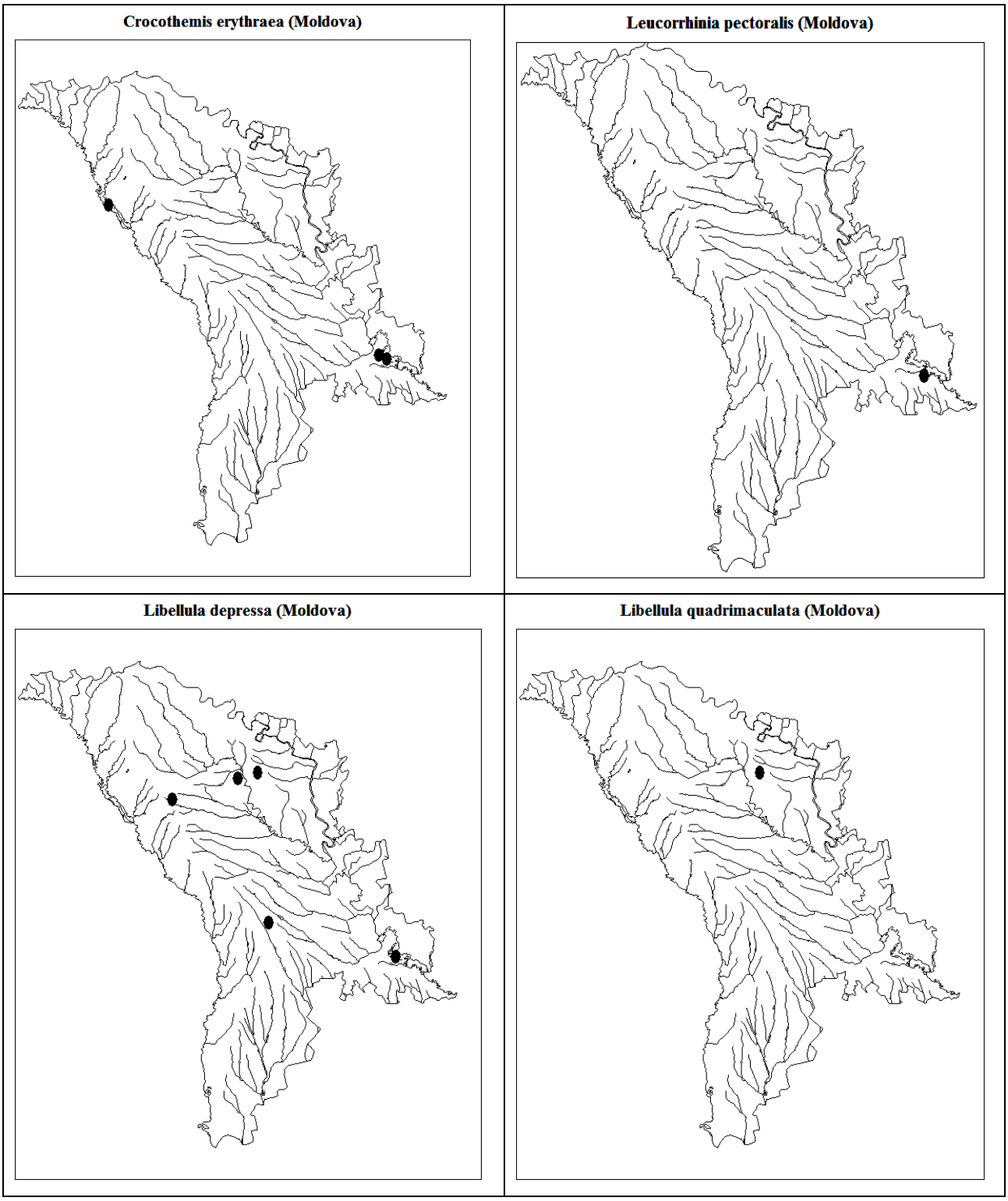
Figures 26 – 29: (more details see page 42)



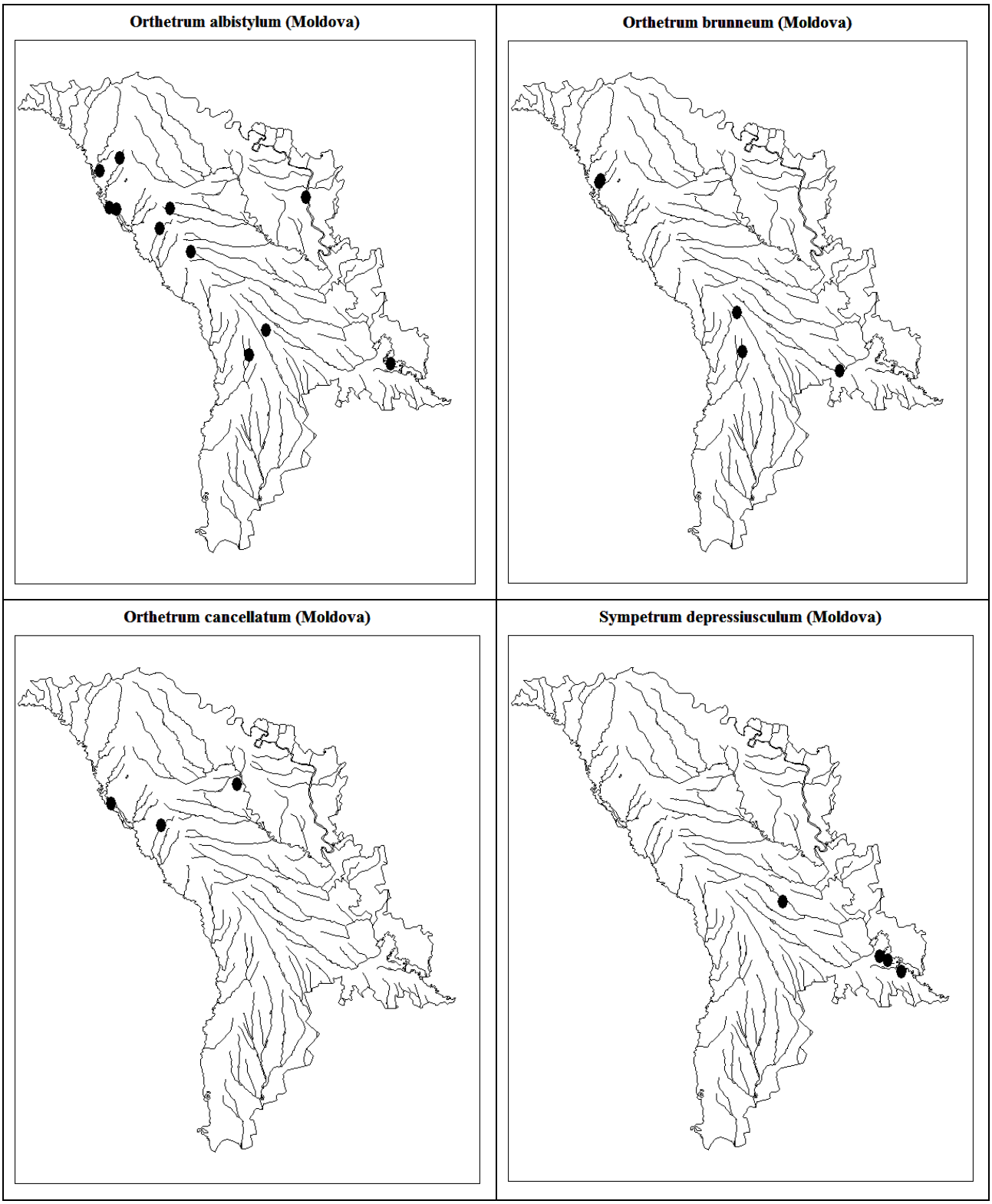
Figures 30 – 33: (more details see pages 42 - 43)



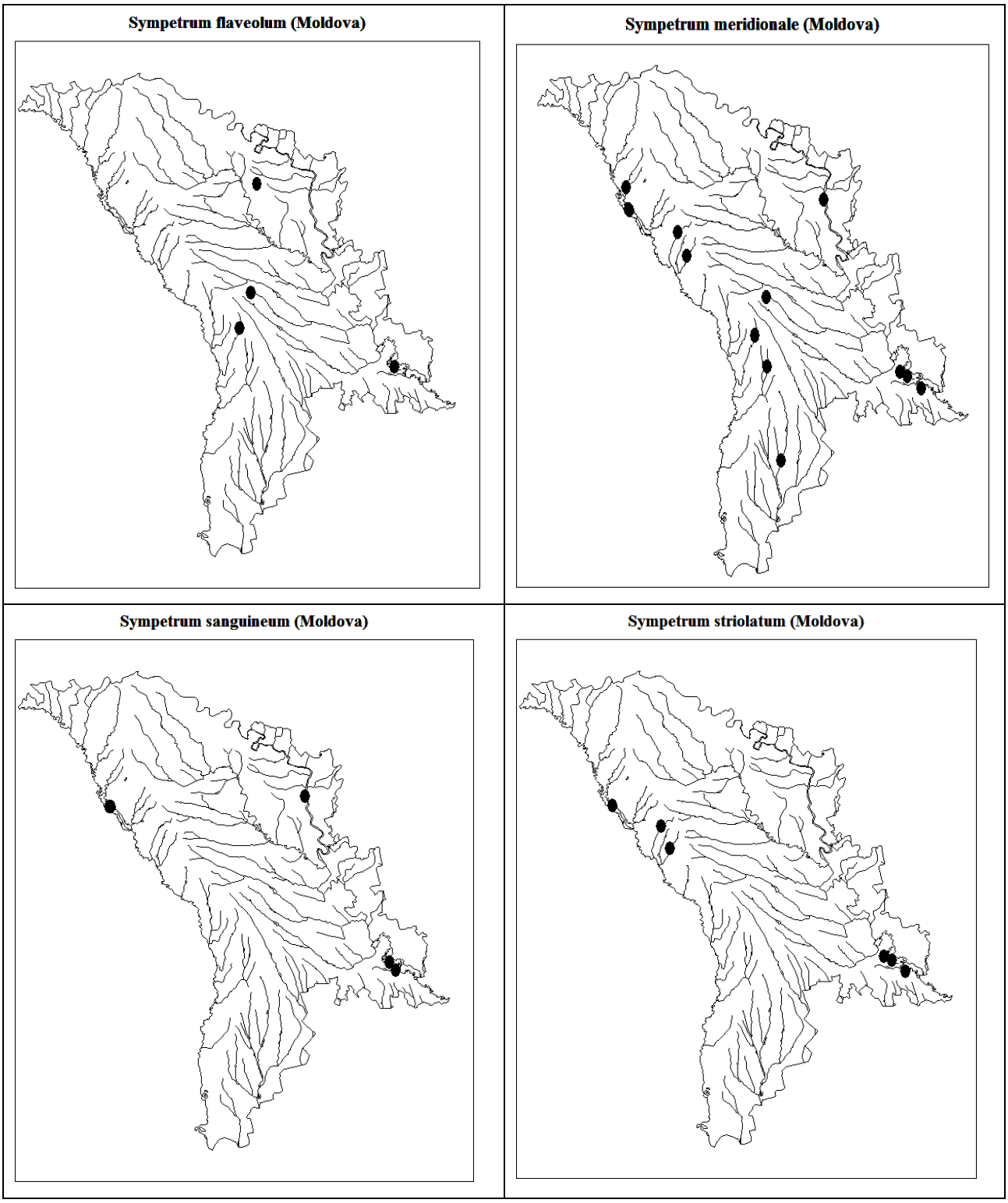
Figures 34 – 37: (more details see page 43)



Figures 38 – 41: (more details see page 43)



Figures 42 – 45: (more details see page 43)



Figures 46 – 49: (more details see page 43)

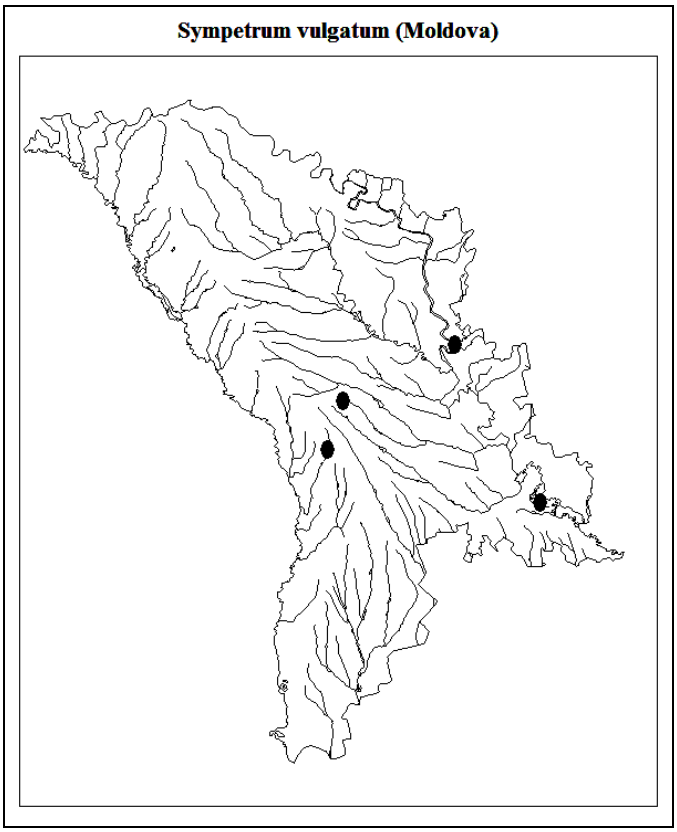


Figure 50: (more details see page 43)

Data origins of the distribution maps of Moldavan Odonata

Figure 14: *Calopteryx splendens* distribution in Moldova (by Dyatlova, current research; Andreev, 1998; Osenimskiy, 2006).

Figure 15:. *Lestes barbarus* distribution in Moldova (by Dyatlova, current research; Andreev, 1998)

Figure 16: *Lestes macrostigma* distribution in Moldova (by Dyatlova, current reseach).

Figure 17: *Lestes parvidens* distribution in Moldova (by Andreev, 1998). Mentioned as *L. viridis* in Andreev, 1998. confused with *Lestes parvidens* which is occurs in the lower Dniester river on Ukrainian side (Dyatlova, 2006).

Figure 18: *Lestes sponsa* distribution in Moldova by (Dyatlova, current research; Bezvali, 1932)

Figure 19: *Sympecma fusca* distribution in Moldova (by Dyatlova, current research; Bezvali, 1932).

Figure 20: *Platycnemis pennipes* distribution in Moldova (by Dyatlova, current research, Andreev, 1998; Osenimskiy, 2006)

Figure 21: *Coenagrion ornatum* distribution in Moldova (by Dyatlova, current research).

Figure 22: *Coenagrion puella* distribution in Moldova (by Dyatlova, current research; Brauner, 1910; Andreev, 1998)

Figure 23: *Coenagrion pulchellum* distribution in Moldova (by Dyatlova, current reseach; Brauner, 1910).

Figure 24: *Coenagrion scitulum* distribution in Moldova (by Dyatlova, current reseach).

Figure 25: *Enallagma cyathigerum* distribution in Moldova (by Dyatlova, current research; Brauner, 1910).

Figure 26: *Erythromma lindenii* distribution in Moldova (by V.V. *Derzhansky* (pers. comm.). The locality is indicated (Andreev, 1998).

Figure 27: *Erythromma viridulum* distribution in Moldova (by Dyatlova, current research; Andreev, 1998)

Figure 28: *Ischnura elegans* distribution in Moldova (by Dyatlova, current research; Andreev, 1998; Osenimskiy, 2006).

Figure 29: *Ischnura pumilio* distribution in Moldova (by Dyatlova, current research; Andreev, 1998).

Figure 30: *Nehalennia speciosa* distribution in Moldova (by Bezvali, 1932). According to (Bernard & Wildermuth 2005), the record of *Nehalennia speciosa is probably doubtful.*

Figure 31: *Aeshna affinis* distribution in Moldova (by Dyatlova, current research; Brauner, 1910; Andreev, 1998).

Figure 32: *Aeshna juncea* distribution in Moldova (by Osenimskiy, 2006).

Figure 33: *Aeshna isosceles* distribution in Moldova (by Brauner, 1910).

Figure 34: *Aeshna mixta* distribution in Moldova (by Bezvali, 1932; Andreev, 1998).

Figure 35: *Anax imperator* distribution in Moldova (by Dyatlova, current research; Bezvali, 1932; Brauner, 1910).

Figure 36: *Anax parthenope* distribution in Moldova by (Dyatlova, current research; Bezvali, 1932; Brauner, 1910).

Figure 37: *Somatochlora flavomaculata* distribution in Moldova (by Brauner, 1910).

Figure 38: *Crocothemis erythraea* distribution in Moldova (by Dyatlova, current reseach; Andreev, 1998).

Figure 39: *Leucorrhinia pectoralis* distribution in Moldova (A.V. Andreev, pers. comm.).

Figure 40: *Libellula depressa* distribution in Moldova (by Dyatlova, current research; Brauner, 1910; Andreev, 1998).

Figure 41: *Libellula quadrimaculata* distribution in Moldova (Brauner, 1910).

Figure 42: *Orthetrum albistylum* distribution in Moldova (by Dyatlova, current research; Andreev, 1998).

Figure 43: *Orthetrum brunneum* distribution in Moldova (by Dyatlova, current research).

Figure 44: *Orthetrum cancellatum* distribution in Moldova by (Dyatlova, current research, Brauner, 1910).

Figure 45: *Sympetrum depressiusculum* distribution in Moldova (by Bezvali, 1932; Andreev, 1998).

Figure 46: *Sympetrum flaveolum* distribution in Moldova (by Bezvali, 1932; Brauner, 1910; Andreev, 1998).

Figure 47: *Sympetrum meridionale* distribution in Moldova (by Dyatlova, current research; Bezvali, 1932).

Figure 48: *Sympetrum sanguineum* distribution in Moldova (by Dyatlova, current research; Artobolevsky, 1917, Andreev, 1998).

Figure 49: *Sympetrum striolatum* distribution in Moldova (by Dyatlova, current research; Andreev, 1998.

Figure 50: *Sympetrum vulgatum* distribution in Moldova (by Bezvali, 1932; Andreev, 1998; Osenimskiy, 2006).