MONITORING the ODONATA of CYPRUS

Dr. David Sparrow
Rosalyn Sparrow
Quick facts on Odonates

- Odonata (Greek: “toothed one”): one of the oldest orders of flying insects

- Two suborders: Anisoptera (“true dragonflies”) & Zygoptera (“damselflies”)

Anisoptera (“not-equal wings”)
Selysiothemis nigra: Black Pennant

Zygoptera (“paired wings”)
Ischnura elegans: Common Bluetail
Quick facts on Odonates

- Undergo an incomplete metamorphosis (hemimetabolous)
  - first part of their lives spent as aquatic larvae (extract oxygen via gills)
  - second stage as air-breathing adult flying insects

- After emergence go away from water to mature sexually (ca 1 week)

- Males then return to water to select and defend a territory
  - females come to the water when they are ready to mate

- Immediately after copulation, eggs deposited either into the water or into vegetation floating on or near the water

Sympetrum striolatum
(Common Darter)
Quick facts on Odonates

- Reproduce in either standing water (lentic species) or flowing water (lotic species)

![Images of various dragonflies]

- Lotic species (above) more or less restricted to streams of the Troodos range

![Images of various dragonflies]

- Lentic species found on reservoirs, freshwater lakes and pools along the side of streams
Odonates as Important Freshwater Bio-indicators

- Freshwater is the most threatened habitat on the planet
  - dragonflies potentially one of the best invertebrate freshwater bio-indicators because

✓ one of best known orders & receive most public attention after butterflies (“birders’ insect”)

✓ adults are conspicuous over water and relatively easy to identify at the species level

✓ sensitive to conditions at the breeding site and surrounding terrestrial area
  - react quickly to changes in environmental quality via active dispersal

✓ powerful indicators of the effects of climatic changes on different levels
  - (single waters, landscape or national / European level)

✓ can rapidly recolonise habitats if favourable conditions restored

For more information see: Kulijer D., Odonata as indicator species of freshwater ecosystem health. mio-ecsde.org/wp-content/uploads/2016/05/Kulijer_Odonata.pdf
History of Odonatology in Cyprus

- Lopau & Adena (2002) - first overview
  - all published data (literature), museum collections, pers. data from 1994, and data from 5 visitors
  - 933 records / 33 species
  - 31 observed and C. virgo and I. pumilio from literature
  - most observations from visitors in June to the south

- Very little attention in period 2002 - 2012
  - 2004: Erythromma viridulum (Flint, unpublished data)
  - 2007: Brachythemis impartita (Cottle)
  - 2007: Trithemis arteriosa (overlooked in the past?)

Cyprus Dragonfly Study Group (CDSG)

- 2012 – established Cyprus Dragonfly Study Group
  - undertook systematic dragonfly recording
  - ten active members do regular monthly or twice monthly monitoring at over 50 selected sites all over the island
  - sites selected for geographical spread, all habitat types and main species

- First priorities:
  - set up a database
  - establish the phenology (flight season) of dragonflies
Monitoring fauna

- Types of monitoring schemes
  - several schemes with different intensities of monitoring

✓ Abundance monitoring
  - most intense following strict rules
  - defined transects, defined monitoring times (e.g. monthly, twice monthly etc),
    conducted only under suitable weather conditions, walk speed etc
  - precise rules vary with different animal groups

✓ Distribution monitoring
  - more opportunistic monitoring, conducted fewer times per year, but recording area of
    monitoring and number of individuals

✓ Opportunistic monitoring
  - presence / absence monitoring, just recording species seen in a particular locality
    without a count of the individuals
April 2013: an unidentified *Ischnura* female in the aurantiaca phase
- at first believed to be *I. pumilio* (only one dubious record from 1894)
- considered to be extinct on Cyprus by Lopau & Adena (2002)
Discovery of a new species on Cyprus

Two weeks later found a male
- identified as *Ischnura intermedia* – new to Cyprus & Europe
Cyprus Dragonfly Study Group (CDSG)

- 2012 – established Cyprus Dragonfly Study Group
  - undertook systematic dragonfly recording
  - ten active members do regular monthly or twice monthly monitoring at over 50 selected sites all over the island
  - sites selected for geographical spread, all habitat types and main species

- First priorities:
  - set up a database
  - establish the phenology of dragonflies

- April 2013: discovered a new species for Cyprus
  - Ischnura intermedia Dumont, 1974

- Brings the checklist to 37 species
  - as reported in the European Atlas, 2015
State of Dragonfly records for Cyprus in 2003-2015

No of *records* and *species* recorded monthly

- ca 17,000 records
- 32 species - 23 anisopterans : 9 zygopterans
- 5 on checklist not observed
Missing species

- **Calopteryx virgo**
  - one record 1932
  - misidentification
  - doubtful if suitable habitats exist

- **Ischnura pumilio**
  - 1894 doubtful record
  - 1948 museum collection
  - extinct

- **Brachythemis impartita**
  - only one set of records - August 2006
  - accidental visitor??

- **Lestes barbarus**
  - last published sighting 1948
  - CDSG unable to find the species

- **Aeshna affinis**
  - Last records 1994
  - CDSG unable to find it
Flight period in Cyprus

- No significant data previously available and only limited information from neighbouring countries

- Quotation from the European Atlas, page 13:
  ‘The information of the flight period in the Meghreb, Turkey and Greece is largely based on records made by people holidaying in these countries. Due to this records from the summer period are over-represented. Fieldwork at other times of year will probably show the flight period of many Mediterranean species to be longer than currently known’

- Developed robust phenology data for 28 of the 32 species observed on Cyprus - flight season for most is indeed longer than previously known
Anisoptera: Number of records

- C. erythraea
- T. annulata
- S. fonscolombii
- O. chrysostigma
- A. parthenope
- S. striolatum
- T. festiva
- O. coerulescens
- O. brunneum
- O. sabina
- T. arteriosa
- O. forcipatus
- A. mixta
- O. taeniolatum
- S. nigra
- D. lefebvrii
- A. ephippiger
- A. imperator
- A. immaculifrons
- O. cancellatum
- C. microstigma
- S. meridionale
- P. flavescens
# Flight season examples

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>France, south</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulgaria &amp; Greece</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyprus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flight season examples

Anax parthenope: no of individuals

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>France, south</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulgaria &amp; Greece</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyprus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Flight season examples

<table>
<thead>
<tr>
<th>Country</th>
<th>Jan</th>
<th>Feb</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>France, south</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulgaria &amp; Greece</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyprus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Sympetrum fonscolombii*: 927 records, recorded in every month.
Flight season examples

**Sympetrum fonscolombii**: 927 records, recorded in every month

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>France, south</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulgaria &amp; Greece</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyprus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Flight season examples

![Dragonfly](image)

<table>
<thead>
<tr>
<th>Country</th>
<th>Jan</th>
<th>Feb</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria &amp; Greece</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyprus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Flight season examples

*Epallage fatime*: no. of individuals

### Flight season examples

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria &amp; Greece</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyprus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Status

- 5 years of solid data
  - phenology of most species resolved
  - habitat preferences understood

- Considerable changes observed in many of the sites monitored
  - impacted by large variation in annual rainfall
  - low rainfall: sites dry up or become choked with reeds
  - tanks: provided good habitats but impacted by water management policies
  - water management below the dams an issue
Climate change in Cyprus

- Temperatures getting hotter: 0.01 deg per year / rainfall decreasing by 1 mm per year
- Significant variation in annual rainfall
- Likely to be challenging for dragonflies – lower oxygen levels in water, less water bodies
For dragonflies, main problem: introduction of fish esp. goldfish into tanks and reservoirs
Way forward

- Experienced recorders: Counts, breeding evidence
  - Systematic visits to important sites

- Good adult ID skills: Complete species lists
  - A few visits to adopted sites

- New recorders, with limited skills & experience: Basic records
  - *Ad hoc* sightings including photographs, BTO/BC surveys

Courtesy: Dave Smallshire, British Dragonfly Society
Dragonfly monitoring in Europe
a progress report

Tim Termaat
Geert De Knijf
Arco van Strien

Tyringe, July 14th 2016
Why?

- Dragonfly trends differ per country: how are they doing on a larger scale?
- Valuable addition to existing EU Biodiversity Indicators
  - Common birds
  - Grassland butterflies
  - Hibernating bats

Grassland butterfly indicator

The indicator shows that since 1990, butterfly populations have declined by more than half, indicating a dramatic loss of grassland biodiversity.
How?

• Too few countries with standardised schemes to monitor species abundance
• But a lot of ‘opportunistic’ records available to monitor species distribution
• Records can be ‘standardised’ in retrospect with occupancy models
Participating ‘countries’

- Sweden
- Britain
- Netherlands
- Flanders
- Wallonia
- North Rhine-Westphalia
- Bavaria
- France
- Andalusia
- Cyprus
European Goals

• It is possible!
• Large datasets needed (sampling period Andalusia & Cyprus too short at present)
• Datasets in most countries grow rapidly!
• With some funding more countries will be able to participate

-> Advocate the potential & importance of dragonflies as a new EU biodiversity indicator
MONITORING the ODONATA of CYPRUS

Dr. David Sparrow
Rosalyn Sparrow