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A previously unrecognized species of *Celastrina* from the southeastern coastal plain region of the United States (Lycaenidae: Polyommatinae) named in honor of the memory of Iryna Zarutska.

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ABSTRACT. New species *Celastrina iryna* is described from the southeastern coastal plain of the United States. This species is most similar to *Celastrina neglecta* but differs by possession of the unique dorsal overlay of clear wing scales found in *Celastrina ladon* males. It is hypothesized that this may be a hybrid species. Some aspects of its life history remain unknown and call for further field research. The species name is a tribute to Iryna Zarutska, of Charlotte, N.C.

Additional key words: Sandhills, wing scales, introgression, hybrid species.

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INTRODUCTION

In his paper 'The Papilionoidea of the South Coastal Area of South Carolina' Gatrelle (1985) included in the Section II species listing:

> "*Celastrina neglectamajor* Tutt. This newly elevated taxon may be the *Celastrina* flying in April in Barnwell and Aiken Counties. Specimens I have taken in April there seem to fit the description of *neglectamajor*…"

Upon Gatrelle's untimely passing, I came into possession of his specimen series from this area and only 8 specimens (5 males and 3 females) of a distinct *Celastrina* phenotype were identified with label dates prior to 1985, all from Aiken and Barnwell counties. Only 6 additional specimens (4 males and 2 females) of the distinct phenotype were found among Gatrelle's *Celastrina* specimens, dated after 1985. These latter included a male taken in Dorchester County, S.C., and a pair taken in Burke County, GA. It is assumed that Gatrelle collected no other specimens of this unique phenotype, though he did collect a number of specimens of typical summer form *Celastrina neglecta* throughout April and summer months in parts of South Carolina and Georgia. No further literature citation or discussion had ensued in the years immediately following the 1985 paper, thus the exact status of this undescribed taxon remained unknown for several years.

METHODOLOGY, FINDINGS AND DISCUSSION

It was the goal, in 2018, to find Gatrelle's original, and nearby locations, in an attempt to relocate this unique population, to make field observations and to determine the hostplant. Over the period of April 18-21, 2018, I had explored the areas from around (and including) Aiken and Barnwell State Parks, then south to the portion of Burke County, GA. adjacent to the Savannah River, then east to Givhans Ferry State Park in Dorchester County, S.C. and one final nearby area in Charleston County. Several intervening

roadside stops were made between all areas. While it was first thought that the unique *Celastrina* population was associated with the fire-adapted ecoregion known as the "Sandhills", only Aiken [S.C.] and Burke [GA.] County study sites fell within this ecological region. The dominant tree type is *Pinus palustris* (Longleaf Pine), which forms the canopy, while *Quercus cerris* (Turkey Oak) and *Vaccinium arboreum* (Sparkleberry) form the subcanopy in some areas. Eastern Barnwell and Dorchester counties, while dominated by pines, do not appear to fall within the Sandhills and are more characteristic of Atlantic Coastal Plain pine forest.

14 male specimens were initially taken during the study period of April 19-21, 2018. A subsequent trip on April 21-22, 2019 proved more productive, with 74 males and 2 females collected. Most were taken at a location in Aiken County near Kitchings Mill (**Figs. 1 & 4**) but none were found within Aiken or Barnwell State Parks despite extensive search. A single fresh specimen was taken within Givhans Ferry State Park and none were found in areas to the south in Charleston County. Specimens were generally not found within forested habitat but were clearly associated with it, being found along roadsides. All specimens were either males that were found either along the forest edge or along dirt roads adjacent to, or within a very short distance of ponds or streams, or females nectaring on various trees along roadsides in upland habitat. In the Sandhills ecoregion, most streams are classified as "blackwater streams" due to a high concentration of tannic acid from decaying vegetation. These streams flow through narrow floodplains, with a forest canopy consisting mainly of *Nyssa biflora* (Swamp Tupelo) and *Acer rubrum* (Red Maple). Both *Pinus serotina* (Pond Pine) and *Pinus taeda* (Loblolly Pine) are dominant on gentle slopes immediately adjacent to these narrow floodplains, with a thick understory of *Vaccinium arboreum* (Sparkleberry). I suspected that this *Celastrina* population might be associated with Sparkleberry, or another hostplant present in the floodplain habitat rather than in the drier *Pinus palustris*-dominated upland habitat. Unfortunately, no females were observed within the pine-dominated habitat other, thus no host association was able to be determined within the forest. No shrubs or trees were in the crucial flower bud stage, with the sole exception of *V. arboreum* that could possibly serve as potential host, at least as observed from areas accessible by car or foot. During the 2019 visit, several *Itea virginica* (Virginia Sweetspire) shrubs were noted along the lakeside at the TL and along other streams in the area, but no females were observed in association with this potential host. Interestingly, larvae of *Celastrina idella* were previously found on *I. virginica* in Virginia Beach, VA.

For adult sustenance, the males were either puddling on mud along dirt roads (**Fig. 4**), or nectaring on *Rubus fruticosus* (Blackberry) flowers. The Givhans Ferry specimen was found nectaring on *Nuttalanthus* (=*Linaria*) *canadensis* (Blue Toadflax) at the edge of mixed deciduous forest. One peculiar observation was noted: Males generally flew very close to the ground, within inches, in a rapid, swirling flight and rarely landing. They also had a very bright, reflective, whitish appearance in flight. This made following them very difficult, and several individuals evaded capture by simply disappearing! I suspect this might be an adaptation to help avoid the countless odonates that patrol the areas where the butterfly occurs.

Aside from this new taxon, no *Celastrina neglecta* or other *Celastrina* species were found during the brief study periods, though Gatrelle had previously found specimens of *C. neglecta* in nearby Burke Co., GA. This is significant, indicating that this is a distinct flight, set between other *Celastrina* flights, and is reminiscent of the flights of *C. neglectamajor*, *C. serotina* and *C. idella* within portions of each of those species' ranges [thus Gatrelle's 1985 assertion that this was *C. neglectamajor*]. Also, it might be noted that no *Celastrina* were observed in association with coastal plain hardwood forest in western Charleston County, along dirt roads and near canals or other waterways.

Fig. 1. *Pinus taeda* (Loblolly Pine) at TL. *Vaccinium arboreum* (Sparkleberry) forms a solid understory in places but does not appeal to *C. iryna* as a host.

To further distinguish this April flight, it might be noted that for several years a population of typical *C. neglecta* was observed and sampled in similar Sandhills habitat in Fairfield County, S.C. This population of *C. neglecta* emerged in numbers during the first week of May annually. The phenotype is typical summer form of *neglecta*, and is unlike the April phenotype presently under study. Similarly, Gatrelle collected *C. neglecta* throughout the months of April through September, throughout much of South Carolina and just over the state line in Georgia, along the Savannah River, indicating *C. neglecta* and *C. iryna* appear to by sympatric in some areas. J. Calhoun (pers. corr.) reports that typical *neglecta* were taken in Gadsden Co., FL., Fannin Co., GA., sympatric with specimens bearing the elongated wing scales, undoubtedly *iryna,* He reports some North Carolina *neglecta* specimens bear elongated scales along the costal margin of the forewing, indicating possible introgression of the unique male scales into some populations of *neglecta.*

During a 2019 trip to the same area, a single living female was placed in confinement in a small container with cuttings of *Itea virginica* and also *Vaccinium arboreum.* The female readily oviposited on *Itea* but completely ignored *V. arboreum*, even when the *Itea* was temporarily removed. When *Itea* was reintroduced, the female resumed oviposition. Young larvae were offered cuttings of *Itea,* on which they developed normally but when transferred to *Vaccinium*, they ignored it and crawled off. As my cuttings of *Itea* dried out, larvae were transferred to *Eriophyid* mite leaf galls on *Prunus serotina* (Black Cherry), which they readily accepted and continued to develop normally. 63 larvae were reared in steady, "indoor" lab conditions under 24 hours of light, lacking daily swings in day/night temperatures, maintained at approximately 77°F throughout their growth. These eclosed during the period of May 22 – June 6, thus producing a subsequent generation of identical phenotype to the natural April flight. 14 larvae were reared in a cool, shaded area in outdoor conditions, thus feeding under outdoor conditions of normal day/night lighting and swings in day/night temperatures, though protected from elements of wind and rain. Those

reared outdoors produced diapausing pupae which were subsequently stored in refrigeration from August through October13-23.

Future research will need to focus on distribution, host association and to confirm voltinism. Gatrelle recorded no specimens outside the April flight window, despite many decades of collecting in South Carolina. Initially, it was presumed that this represents a univoltine taxon. However, on June 1 2023, Marty and Dave Kastner visited the proposed TL and found only *C. neglecta* on the wing. A return visit on June 21, 2023 to the same location showed an emergence of *C. iryna*, based on several photographs. A subsequent visit to the Smithsonian National Museum of Natural History revealed a specimen collected in Atlanta, GA. on July 1. John Calhoun was contacted to see if he had any *Celastrina* specimens from the study region and found several specimens of the new species, dated April 10-June 15 (Florida) and April 26-August 6 (Georgia), thus further confirming that this species is, at least, partially multivoltine. Three specimens were identified and confirmed from Mississippi in the Ricky Patterson collection. Additional photographic evidence is scarce, mostly based on ventral characters of very reduced black spotting. A photo taken by Sarah S. Kelley near Orangeburg, S.C. (Orangeburg Co.) on 16 April 2023 shows a ventrally nearly pure-white individual, characteristic of *C. iryna*

In Wright, *et al* (2019), it was revealed that *C. neglecta*, bearing the unique dorsal male wing scale structure of *C. ladon,* occurs in several counties across northern Florida. It was theorized that this represents a hybrid taxon, resulting from an ancient hybridization event. This is believed to have occurred about 20-25,000 years ago, during the Wisconsin glacial maxima, resulting in the introgression of the unique, elongated *ladon* male wing scales and loss of androconia, into *C. neglecta*. In a recent rearing experiment (Friedman, et al., 2019), several adults of this uniquely-scaled phenotype were obtained from natural ovipositions on *Nyssa sylvatica* (Black Tupelo). The immature stages were documented. Adults were also obtained from earlier (2012) rearing on *Prunus caroliniana* (Carolina Laurel Cherry) (Wright, *et al*, 2019).

***Celastrina iryna* Pavulaan - new species**

ZooBank registration: urn:lsid:zoobank.org:act:B948A7A8-6389-4E04-BA97-0C5D27D8C901

Description. *Male* (**Figs. 2(A)** and **2(C)**). Forewing length 12-15 mm, averaging 13.9 mm (n=91). Dorsal color uniform light blue, but variable with some individuals with a distinct violet-blue tint. Like *neglecta* males. White insuffusion between veins on DHW variable. Wing fringes white; black checkering minimal to absent. The primary difference from *neglecta* males is the absence of androconia and the presence of elongated wing scales (**Fig. 3**) previously only known in *C. ladon* and *C. nigra.* This was illustrated in Wright, *et al* (2019) for reared specimens in Okaloosa Co., FL. This character gives males a unique matte-like reflectance. Ventral color uniform light gray to white. Black maculations like *neglecta* but greatly reduced, with some individuals being nearly immaculate white beneath. *Female* (**Fig. 2(B)**). Forewing length 14-15 mm, averaging 14.5 mm (n=6). Dorsal color lustrous metallic light blue with a light wash. As in *neglecta*, black on DFW costa and outer margin. Wing fringes white; black checkering minimal to absent. Ventral color and pattern as in male. Females are extremely difficult to differentiate from *neglecta*, though the ventral side is often nearly immaculate white. Readily differentiated from *ladon*, which are darker violet dorsally, darker gray ventrally with enlarged maculations.

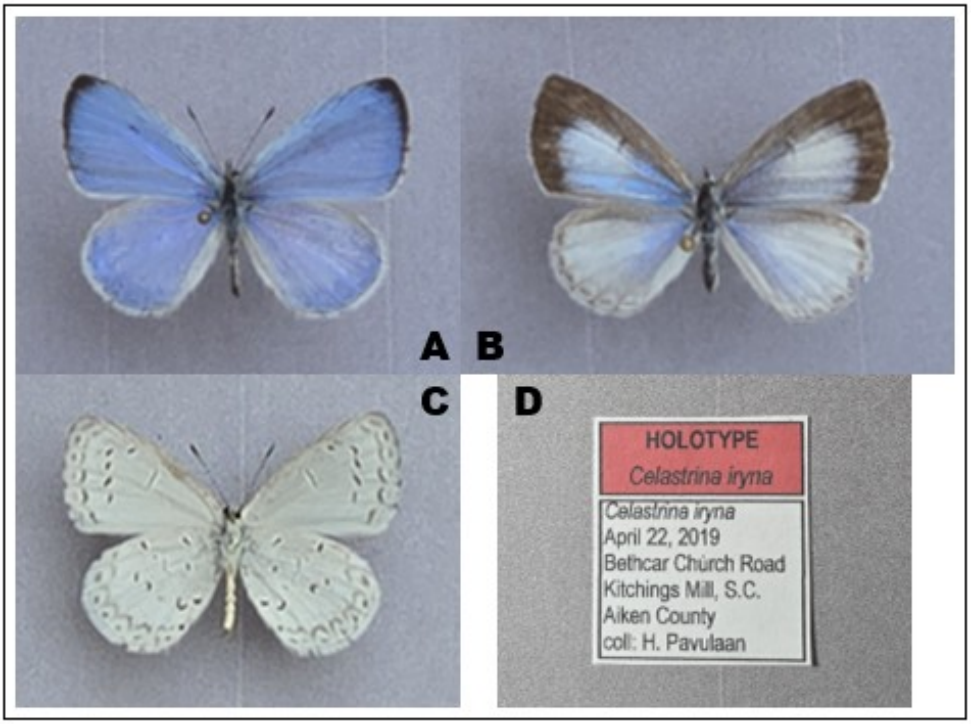

Fig. 2. (A) Holotype male, dorsum, 4/22/2019, Aiken County, S.C. (leg. H. Pavulaan). **(B)** Allotype female, dorsum, 4/20/2000, Jasper County, S.C. (leg. R. R. Gatrelle). **(C)** Holotype male, venter (same data as (A). **(D)** Holotype label with data.

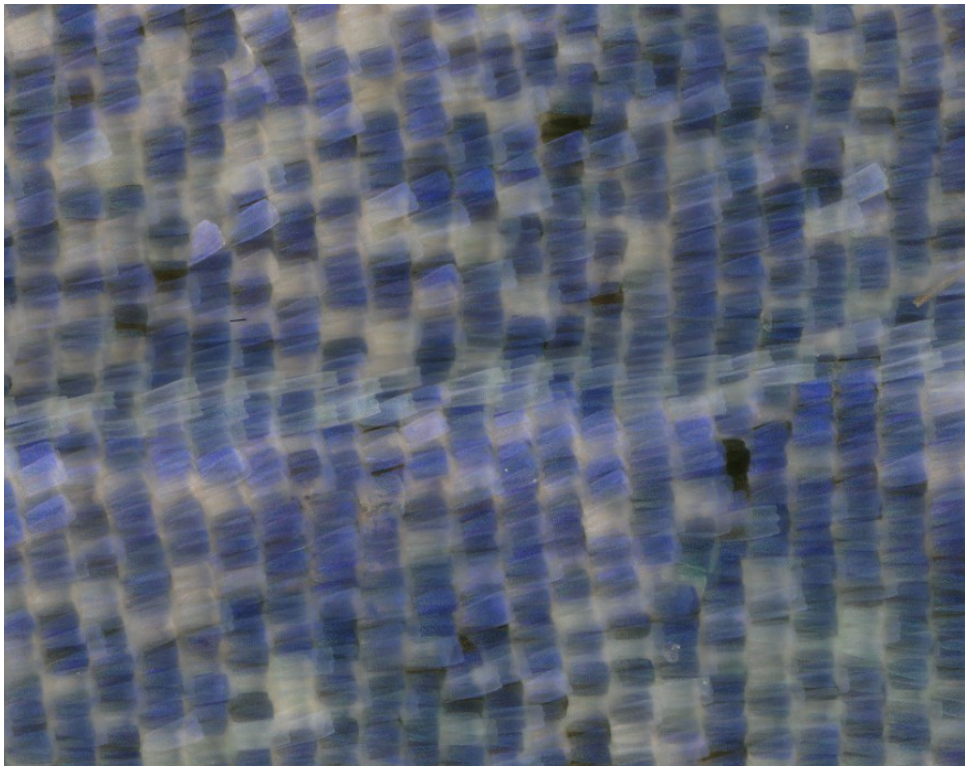

Fig. 3. Magnified image showing an overlay of elongated clear wing scales covering normal blue and white scales on male dorsal forewing. No curved androconia are present. Topotype specimen from the TL. Photo courtesy Vince Ficarrotta.

Fig. 4. Type locality along Bethcar Church Road, Kitchings Mill, Aiken County, S.C. Males patrol the road and dirt pulloff.

Holotype. (**Fig. 2A & 2C**): Kitchings Mill, Aiken Co., South Carolina, Bethcar Church Road, .4 mi. (.65 km.) north of State Route 302, 22 April 2019 (33-35-52.57N, 81-27-49.00W) (*leg.* H. Pavulaan). **Allotype** female (**Fig. 2B**): Pineland, Jasper County, S.C., 4/20/2000 (*leg.* R. R. Gatrelle). Both deposited in the McGuire Center for Lepidoptera & Biodiversity.

Paratypes examined for this study: All in collection of the author except where noted. FLORIDA: Liberty Co., Torraya State Park, 4/21/1984, leg. Scott W. Gross, in collection of NMNH). GEORGIA: Burke Co., Brigham Landing, nr. Girard, 4/3/1997 (1 male, leg. R. R. Gatrelle), 4/20/2000 (2 males, 1 female, leg. R. R. Gatrelle); Fulton Co., Atlanta (1 male, 7/1/1951, leg. G. Held, in collection of NMNH). MISSISSIPPI: Adams Co., Homochitto National Forest, 1 March 2008 (2 males), R. Patterson collection. Adams Co., Sandy Creek WMA, Pipes Lake, 1 March 2008 (1 male), R. Patterson collection. SOUTH CAROLINA: Aiken Co., Kitchings Mill, 4/23/1977 (2 males, leg. R. R. Gatrelle), 4/20/1990 (2 males, leg. R. R. Gatrelle), 4/19/2018 (11 males), 4/21/2018 (3 males), 4/21/2019 (42 males), 4/22/2019 (32 males, 1 female); Barnwell Co., Barnwell. 4/16/1977 (2 females, leg. R. R. Gatrelle), Blackville (4/16/1977, 3 males, 1 female, leg. R. R. Gatrelle); Dorchester Co., Givhans, 4/27/1975 (1 male, leg. R. R. Gatrelle), 4/29/1987 (2 males, leg. R. R. Gatrelle), Givhans Ferry State Park, 4/20/2018 (1 male, S.C. State Parks Permit #N-7-18). Jasper Co., Pineland, 4/20/2000 (1 female **allotype**, leg. R. R. Gatrelle). Additionally, 63 reared specimens (27 males, 36 females) from a female taken at the TL are included as paratypes since the phenotype is identical to the April flight. Many paratypes to be disseminated to collections of the McGuire Center for Lepidoptera and Biodiversity and the Smithsonian National Museum of Natural History).

Flight period: Though the April flight in Aiken Co., S.C. is widespread and common, voltinism is not fully documented. The species is apparently multivoltine as evidenced by imagery taken in the same area in June, but flies during other months in other areas. FLORIDA: two broods evident from 27 March –

15 June. GEORGIA: multivoltine from April 3 – August 6. MISSISSIPPI: 1 March. SOUTH CAROLINA: April 3 to 29.

Hosts: Females readily oviposited on *Itea virginica* (Virginia Sweetspire) in confinement, and larvae developed normally on this host. This host is present along watercourses and water body edges in the habitat area. In confinement, females will not oviposit on *Vaccinium arboretum* (Sparkleberry), abundant in the forest understory in the study area. In Florida, *Nyssa sylvatica* (Black Tupelo) was documented (Friedman, et al, 2019) and larvae were reared on *Prunus caroliniana.* *Eriophyid* mite leaf-galls on *Prunus serotina* (Black Cherry) were accepted by lab-raised larvae (**Fig. 5**). Additional hosts listed by Friedman (2016) in the Panhandle region of Florida may refer to *C. neglecta* rather than *C. iryna*: *Prunus serotina* (Black Cherry), *Aralia spinosa* (Devil's Walking Stick) and *Oxydendrum arboreum* (Sourwood). Similarly, a report of *Verbesina virginica* (White Crownbeard) in Jackson County, FL. (Harvey & Webb, 1980) needs to be tested as a potential host for *C. iryna.*

Fig. 5. 4th instar *C. iryna* larva reared on *P. serotina* leaf galls. Photo: H. Pavulaan

Range. Verified and reported county localities include: **FLORIDA:** Clay, Gadsden, Liberty, Okaloosa, Wakulla Counties. **GEORGIA:** Burke, Fannin, Fulton Counties. **MISSISSIPPI:** Adams County. **SOUTH CAROLINA:** Aiken, Barnwell, Dorchester, Jasper, Orangeburg Counties.

Diagnosis: In the study area of South Carolina, *C. iryna* is known to fly primarily in April, with subsequent broods requiring better confirmation. Interestingly, "true" (nominotypical) *C. neglecta* [not bearing the unique male wing scale structure] occurs in the same area in March (Ron Gatrelle collection). In Fairfield County, S.C., nominotypical *C. neglecta* occurs in Loblolly Pine-dominant Sandhills habitat in early May, and *C. iryna* is absent. John Calhoun (pers. comm.) reported males with the unique wing scale structure occurring in three northern Florida counties from April 8 to June 15, while "true" *neglecta* was confirmed on June 17.

This species is the third described species to bear the unique wing scale structure previously only known for *C. ladon* and *C. nigra*. Whether this phenotype represents an introgressed *C. ladon x C. neglecta* "hybrid species", a more ancient taxon, or an evolutionary offshoot remains to be determined. It does not appear to be a present-day, traditional hybrid population based on general allopatric flight with *neglecta* at the TL.

Etymology. The species name is a tribute to Iryna Zarutska (**Fig. 6**), the 23-year-old Ukrainian refugee who was senselessly murdered on August 22, 2025, on a Charlotte, N.C. transit car. Common name: **Iryna's Azure**. The name is derived from the Greek goddess of peace, and is associated with tranquility, harmony and serenity.

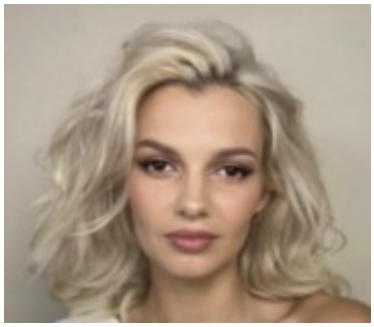

Fig. 6. Iryna Zarutska. May 22, 2002 – August 22, 2025

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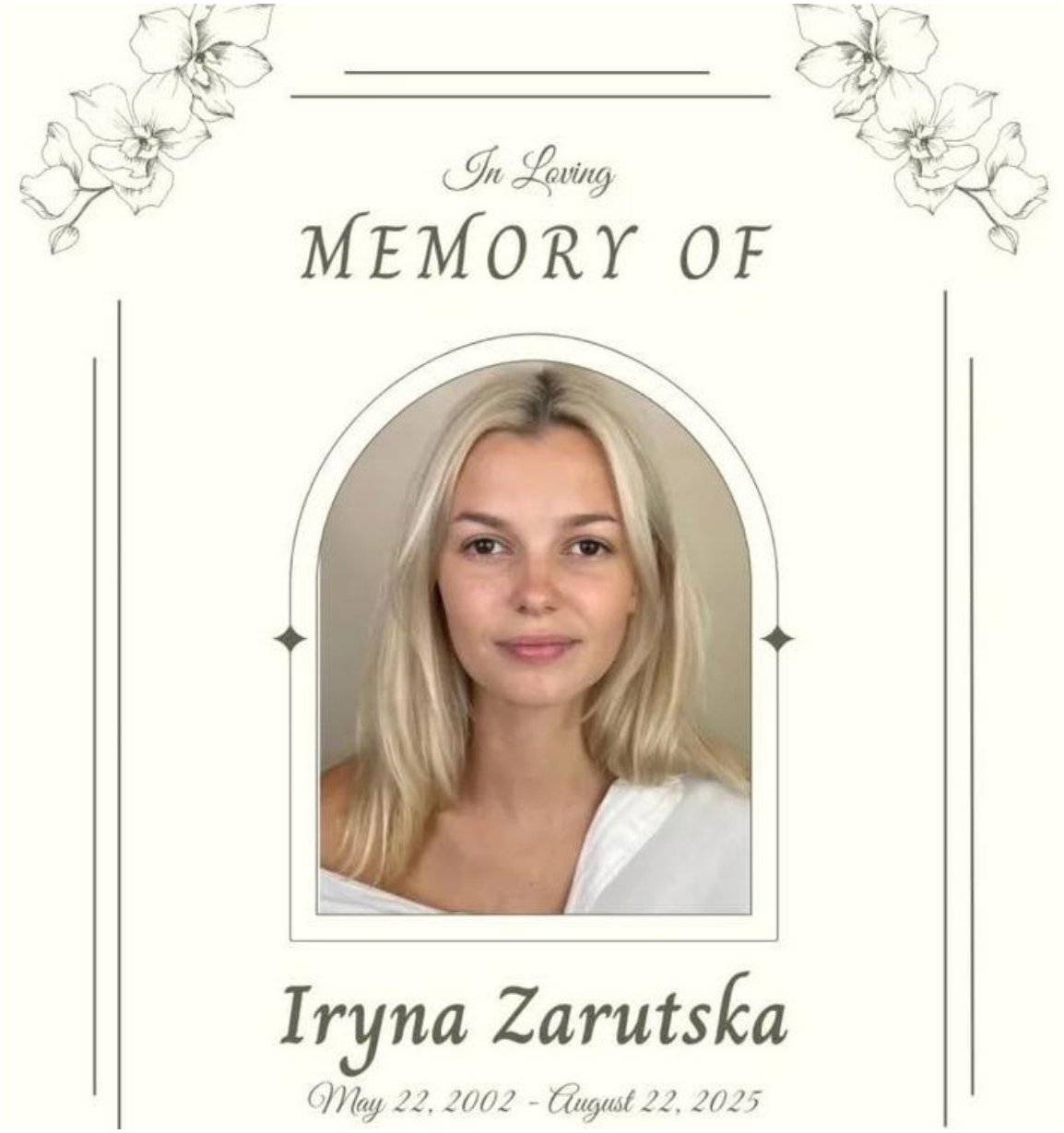

May she never be forgotten.